Regional Financial Deregulation, International Portfolios and Risk Sharing – Three Essays

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The Faculty of Economics, Business Administration and Information Technology of the University of Zurich hereby authorises the printing of this Doctoral Thesis, without thereby giving any opinion on the views contained therein.

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Preface

This thesis emerged from the research that has been done at the Institute for Empirical Research in Economics in Zurich. By that time, I have joined a group of people whose invaluable contribution made the successful completion of this thesis possible.

First and foremost, I want to express my deep and sincere gratitude to my supervisor, Professor Mathias Hoffmann. I appreciate all his stimulating contributions that made my research effort more productive. His joy and enthusiasm for research was inspiring and motivating for me, even during tough times. Thank you for introducing me to empirical research.

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Iryna Stewen, September 2010

Chapter 1

Introduction

To regulate or not to regulate – that is the question. In the midst of the biggest economic crisis since the Great Depression, a great number of academics and policy-makers has been concerned with this question. Since 2007-2008 policy-makers have been arguing over pro and contra of financial regulations. However, most of the academics agree that deregulated financial markets are more welfare enhancing than regulated ones. Demyanyk et al. (2007, p.) refer to the banking deregulation *"as an impetus for an economic process with significant real effects at the macro level"*.

Although this thesis contains several lines of research and consists of three independently written papers, the effects of banking deregulation on the real economy are at the heart of it. Chapter two studies the dependence of different channels of risk sharing on the business cycle and how banking deregulation has affected the pattern of risk sharing and its dependence on the business cycle. Portfolio holdings constitute one possibility of risk sharing. The determinants of portfolio holdings across countries are analyzed in chapter three. It is the only chapter that exploits the international dimension. In chapter four, I come back to banking deregulation and highlight the implications of the US banking deregulation for capital income flows across US states.

The introductory chapter is organized in the following way. In section 1.1, I give formal definitions of the main concepts and report some stylized facts on them. Section 1.2 provides an overview of this thesis in more detail.

1.1 Formal definitions and stylized facts

Consumption Risk Sharing

The existence of idiosyncratic income and output shocks explains the urge to insure consumption, which is captured by the concept of consumption risk sharing.[1] The implication of full risk sharing has been known for many decades since the seminal work of Arrow (1964) and Debreu (1959). Wilson (1968) and Diamond (1967) derived the basic proposition that optimal allocation of risk bearing implies that - under certain conditions - the household changes in consumption should move one-for-one with aggregate changes in consumption. Formally, in a world with complete markets and homogeneous agents with respect to preferences, growth in marginal utility should be equated across agents, so that in all states of nature $\frac{u'(C^k_{t+1}(s))}{u'(C^k_t(s))} = \lambda(s)$ holds, where s indexes the state of nature and $\lambda(s)$ is the growth in the shadow-price of consumption. Thus, by pooling together their risk, agents insure fully against non-aggregate uncertainty in their resources. Only differences in preferences or measurement error can account for the dispersion of consumption changes across households and not, for example, the current change in household's income. Most findings in the empirical analysis based on the micro-level data reject the theory.[2]

However, these studies served as a useful background for researchers interested in modelling macro-economies, who have extended the approach used to compare consumption and output changes across countries as well as across regions within a single country. Atkeson and Bayoumi (1993a) reject the hypothesis of full insurance in panels for the United States and OECD countries. Canova and Ravn (1996) formally examine the implications of international consumption risk sharing for a panel of industrialized countries. The cross equation restrictions imposed by the theory are rejected. Obstfeld (1994) shows that the coefficients in time-series regressions of each country consumption growth rate on the world consumption growth rate are positive

[1] I use terms 'consumption risk sharing' and 'risk sharing' interchangeably.

[2] The first tests on consumption insurance were tests of market completeness proposed by Cochrane (1991) and Mace (1991), and Townsend (1994), who used micro-data (person or household data) from the United States and villages in India, respectively.

but smaller than unity. This result indicates that there is only partial risk sharing. Lewis (1996) finds an evidence that consumption growth rates in countries with capital market restrictions covary more strongly with domestic output variations relative to the world than unrestricted countries. However, risk-sharing tests among countries with relatively unrestricted capital markets were also rejected. Taken together, these results present substantial evidence against full risk sharing.

Recognizing that risk sharing may be imperfect, researchers suggested to examine what the extent of consumption risk sharing is and whether it differs across countries and regions. Crucini (1999) shows that there is much more risk sharing across the Canadian provinces and the US states than there is across G-7 countries. Asdrubali, Sørensen and Yosha (1996) (henceforth, ASY) have developed an approach for measuring the degree of risk sharing based on cross-sectional variance decomposition of shocks to gross state product. According to their study, 25 percent of shock impact in the United States remain uninsured in the period 1963-1990.

Another important feature of the framework proposed by ASY is its ability to identify and analyze some exact mechanisms of risk sharing. ASY developed a method integrating the major risk sharing mechanisms in a unique framework. They considered three channels through which risk can be shared. First, region specific risks can be shared via cross-ownership of productive assets (portfolio diversification), facilitated by developed capital markets. This channel is also called income smoothing channel. Second, regions can smooth their consumption by adjusting their non-contingent asset holdings, for example through lending and borrowing at intranational credit markets. This channel is often referred to as consumption smoothing. Third, governments or international organizations can arrange a fiscal transfer system that can serve as a mechanism for further income and consumption smoothing. These channels of smoothing are often referred to as capital market, credit market, and federal government smoothing. For the period 1963-1990, ASY found that in the US states 39 percent of regional income shocks are smoothed by capital markets, 23 percent are smoothed by credit markets, and 13 percent are smoothed by the federal government.

Altogether, although perfect insurance is not achieved, there is considerable risk sharing among US states.

In fact, the variance decomposition method suggested by Asdrubali, Sørensen, and Yosha (1996) has become the workhorse for most macroeconomic studies on inter- and intranational risk sharing. Sørensen and Yosha (1998) use this approach for a group of EC, as well as for a larger group of OECD countries. For both groups of countries, the results reveal that a large fraction of idiosyncratic output shocks (about 60-70 percent) remains uninsured. In particular, unlike the interstate capital market in the US, international capital markets play a very small role for international consumption risk sharing. The whole scope of international risk sharing – about 30 percent of a shock to a country's output – takes place through credit markets. These results are also consistent with the findings of Crucini (1999) and confirm the home bias results of French and Poterba (1991).

Home Bias

Home bias refers to the feature of international portfolio allocation that portfolio holdings are usually strongly skewed towards domestic assets. This fact is also called 'international diversification puzzle'. It arises because although the benefits of international portfolio diversification are significant, investors continue to hold the majority of their equity portfolios in local rather than foreign-based firms.

The degree of home bias hinges on the benchmark or optimal weighting employed from which deviations can be established. There exist three measures that can be used for this purpose. The first is a nominal bias measured with respect to the proportion a country's equity contributes to world equity capitalization. The second measure is a normal bias, measured with respect to normal or average industry allocations. The third measure is an optimal bias, measured with respect to an optimal combination determined by risk and return profiles using for example a mean-variance framework.

French and Poterba (1991) estimate the domestic ownership share of the world's five largest stock markets to be 92.2% for the US, 95.7% for Japan, 92% for the UK, 79% for Germany, and 89.4% for France. Moreover, home bias also exists at the regional level: regions tend to hold the productive assets of enterprises from its own regions. A more recent literature - see Sørensen et al. (2007), Artis and Hoffmann (2007a, 2007b), Schoenmaker and Bosch (2008) - provides evidence that home bias in assets has started to decline in the last two decades.

The literature on home bias offers so many explanations with respect to the reasons and causes for this phenomenon that it is impossible here to give justice to all of them.[3] The key explanations are (1) capital market regulation and other restrictions for international investments, transaction costs, difference in taxation; (2) asymmetric information; (3) insufficient evidence of benefits, (4) behavioral and (5) trade costs in goods sector.[4] Moreover, relative home bias can be an effect of individuals' different desires to hedge against such types of risks as inflation or real exchange rate and non-traded wealth, such as human capital. To date, no single of these reasons has proven to be sufficient to fully explain a puzzle of home bias.

Furthermore, recent work by Sørensen et al. (2007) demonstrates that the degree to which income smoothing through capital flows varies positively with the share of foreign assets in country wealth. They argue that the lack of international consumption risk sharing and the equity home bias are 'twin puzzles separated at birth'.

US Banking Deregulation

The literature has distinguished between two dimension of state-level deregulation: intrastate deregulation removed branching and merger restrictions for banks and bank holding companies that were domiciled in a state. Interstate deregulation allowed access to the local market by out-of state banks

[3] For excellent surveys see Lewis (1999) and Karolyi and Stulz (2003).

[4] See e.g. Stulz (1981), Tesar and Werner (1995), Ahearne, Griever and Warnock (2004); Gehrig (1993), Van Nieuwerburgh and Veldkamp (2010), Coval and Moskowitz (1999), Hasan and Simaan (2000), Portes and Rey (2005); Hubermann (2001), Chan et al. (2005); Obstfeld and Rogoff (2001); Adler and Dumas (1983), Cooper and Kaplanis (1994).

and bank holding companies (often on a reciprocal basis) thus making the interstate pooling of bank funds possible.

Since the 1920s bank's ability to branch and form multi-bank holding companies both within and across state borders has been subject to state legislation. Although some states deregulated the branching restrictions in the 1930s, most of them generally prohibited the operation of out-of-state banks and also strongly limited bank branching within a state, to the point that in some states banks where allowed to operate only a single branch. The Douglas Amendment to the Bank Holding Company Act of 1956 gave states the seigniorage to prohibit out-of-state banks from acquiring banks outside the state where it was headquartered. All states exercised this privilege and thus effectively preclude interstate banking.

Prior to the 1970s, almost all states had laws restricting within-state branching. Statewide branching were allowed only in twelve states. Gradual abolishment of these restrictions has started in the late 1970s, so that all states, but Iowa, have deregulated their restrictions on branching within states by 1994. Intrastate banking deregulation took place in two main forms: First, states permitted branching through mergers and acquisitions (M&A) and followingly allowed banks and bank holding companies to acquire another bank and convert it into branch. Second, de novo branching was permitted, whereby regulation prohibiting existing banks from entry by outside banks was lifted. In most cases, branching by M&A occurred first, then unrestricted branching deregulation occurred soon thereafter. So, in the empirical analysis I will apply a single branching indicator based on the date at which a state first permitted branching by M&A.

Interstate banking (as opposed to branching) through bank holding companies was gradually permitted by each state during the 1980s. Maine was the first to allow in 1978 entry by bank holding companies from any state that allowed entry by Maine banks. It took 17 years till Hawaii had passed reciprocal entry laws in 1995 as a last state. The deregulatory process was completed with the Reigle-Neal Interstate Banking and Branching Efficiency Act, which became effective in 1997.

States deregulated in waves, or cohorts, rather than all at once. The staggered timing of both inter- and intrastate deregulations provides an ideal laboratory to explore empirically how these regulatory changes affected banking and the real economy.

1.2 Outline

It is important to emphasize that each of the three chapters represents a self-contained paper. Each of the following chapters starts with an introduction and ends with a conclusion. The summary in chapter five recapitulates the main insights of this thesis. I use the remainder of this introduction to briefly highlight the main results of the three central chapters.

Chapter two focuses on the implications of banking deregulation on consumption risk sharing.[5] First, this chapter demonstrates that consumption risk sharing among US federal states increases in booms and decreases in recessions. Second, we find that small firms' access to credit markets plays an important role in explaining this stylized fact: business cycle fluctuations in aggregate risk sharing are more pronounced in states in which small firms account for a large share of income or employment. In addition, this chapter documents the effects of banking deregulation on consumption risk sharing, its pattern and its dependence on business cycle. We show that better access of small firms to credit markets in the wake of state-level banking deregulation during the 1980s seems to have loosened the dependence of aggregate risk sharing on the business cycle. Not only do our results support that better access to credit markets may have made it easier for the owners of small firms to smooth income in the face of adverse cash-flows shocks to their business. They suggest a major additional benefit from banking deregulation: access to bank credit has become more reliable and is more easily available when households and firms need it most urgently – in economic downturns.

Chapter three seeks for the determinants of equity home bias at in-

[5]This chapter is based on joint work with Mathias Hoffmann (Hoffmann and Shcherbakova-Stewen (2010)).

ternational level.[6] Theoretical models that try to reconcile features of international portfolio holdings in general equilibrium framework have not yet reached a consensus on the mechanisms that explain home bias. However, the commonality of the majority of these models is an real exchange rate hedging term. This term captures the relationship between real exchange rate changes of two countries and equity excess returns of a country relative to another country. Using data on real exchange rates and equity returns for industrial and emerging countries from 1982 to 2007, I estimate the correlations of real exchange rate changes and excess returns. While the results for industrial countries are mixed: only non-members of EMU exhibit positive correlations that are significantly different from zero, all emerging countries have positive and significant correlations of relative inflation and excess returns. Moreover, these correlations help explain the observed share of home equity in portfolio and are of more importance for countries that are more open in trade and in the financial sector.

Chapter four focuses on the interaction of domestic financial development and financial integration represented in this setup through intra- and interstate deregulations, respectively.[7] The way intra- and interstate deregulations have been implemented across US states offers a great opportunity to use the experience of the United States as a natural laboratory to study not only the accruement of global imbalances but also their implications. The recent literature on global imbalances increasingly emphasizes the link between domestic financial development and financial liberalization on the one hand and the occurrence of global imbalances on the other hand. Several recent prominent studies argue that financial integration of unequally developed financial markets may trigger both the large financial imbalances as well as the composition of these imbalances. This chapter examines whether the mechanism proposed by the theoretical literature could be observed at the interstate level. In particular, we focus on the pattern and direction of capital flows among US states following deregulation. This chapter illustrates that the predictions of the theoretical model of Mendoza et al. (2009)

[6] This chapter follows Stewen (2010a).
[7] This chapter is based on Stewen (2010b).

are clearly confirmed in the US data: states with more developed financial markets experienced increase in the income/output ratio and decrease in the income/consumption ratio following interstate banking deregulation. These results suggest that more developed states invest rather in productive (risky) assets but also accumulate foreign debt. Moreover, in less financially developed states savings have increased after interstate banking deregulation indicating positive holdings of riskless assets.

Chapter 2

Consumption Risk Sharing over the Business Cycle: the Role of Small Firms' Access to Credit Markets[8]

2.1 Introduction

Consumption risk sharing among US federal states increases in booms and decreases in recessions. We find that small firms play an important role in explaining this stylized fact: business-cycle fluctuations in interstate risk sharing are most pronounced in states in which small firms account for a large share of income or employment. State-level banking deregulation during the 1980s has, however, dampened this dependence of aggregate risk sharing on the business cycle. Our findings support the view that banking deregulation has considerably improved credit market access for small firms, in particular in recessions, when it is most urgently needed.

Our analysis places itself at the intersection of two important recent strands of the literature. The first strand emphasizes that the degree to which certain household groups and small firms have access to financial markets varies dramatically over the business cycle. In particular, a considerable

[8] This chapter is based on Hoffmann and Shcherbakova-Stewen (2010).

body of theoretical and empirical work on the financial accelerator[9] has argued that tightening collateral constraints in credit markets may act as a potentially powerful amplification mechanism for aggregate shocks. Gertler and Gilchrist (1994) were among the first to illustrate empirically that small firms with their strong dependence on bank finance are particularly exposed to such shocks.

We provide a comprehensive taxonomy of business-cycle variation in interstate risk sharing. First, we show that the extent to which interstate risk sharing varies with the aggregate output cycle is quantitatively important: over our sample period, which ranges from 1963 to 2005, on average almost 80 percent of state-specific shocks to output are shared across state borders. However, this average masks considerable variation over time: at the trough of the typical NBER recession during that period, the fraction of risk shared was almost 20 percentage points below this level. This dependence of aggregate risk sharing on the business cycle is robust to controls for other factors such as stock market and housing price fluctuations, which, as recently argued by Lustig and van Nieuwerburgh (2005), may also affect the ability of households to share risk across regional borders.

Secondly, we identify the sources of the procyclical variation in interstate risk sharing. Specifically, we ask through which channels risk is shared and how the contribution of these channels varies over time. Following Asdrubali, Sørensen and Yosha (1996) we distinguish between three channels of risk sharing: income smoothing (through interstate flows of capital and labor income), fiscal transfers and consumption smoothing through personal saving and dissaving. As the main source of the procyclicality in aggregate consumption risk sharing, we identify strong procyclical fluctuations in the extent to which a region's households can smooth consumption through saving and dissaving. Importantly, this very characteristic pattern of risk sharing over the business cycle is determined mainly by federal states where small businesses are particularly prevalent as employers, or where the income of small business owners accounts for a large share of state personal income.

[9] We will not attempt to survey this work here. Leading examples include Bernanke (1983), Bernanke and Gertler (1989) and Kiyotaki and Moore (1997).

To shed more light on the role of small businesses in the time variation in aggregate risk sharing, we connect to a second strand of the literature. Starting with Jayaratne and Strahan (1996), a series of studies has exploited the experience of US state-level banking deregulation during the 1970s and 1980s as a natural laboratory in which to study the effect of liberalization on growth, the comovement of regional business cycles (Morgan, Rime and Strahan (2004)) and, more recently, risk sharing (Demyanyk, Ostergaard and Sørensen (2007), Acharya, Imbs and Sturgess (2007)). We build on these papers in arguing that this wave of deregulation has had a significant impact on small firm access to credit: small firms typically cannot issue stocks or bonds, and therefore rely heavily on bank finance. The key aspect we emphasize here is that this makes them vulnerable to changes in local credit market conditions that tend to worsen in downturns and to improve in booms. At the same time, the business and private finance of small business owners are closely intertwined, so that fluctuations in the access to business credit are also likely to affect the ability to smooth personal consumption over time. State-level banking deregulation transformed a highly fragmented, localized banking system into a system with larger banks that can pool funds across local and state boundaries. We conjecture that this makes the availability of credit less dependent on the phase of the business cycle, and that small firms would be prime beneficiaries of such a development.

Our results provide strong support for this hypothesis. We document that intrastate banking deregulation has dramatically lowered the variability of risk sharing over the cycle: before deregulation, each additional percentage point of GDP growth increased aggregate risk sharing by around 3–4 percentage points. This variability in the extent to which state-level idiosyncratic risks can be shared across the nation has almost vanished as a result of the abolition of intrastate bank branching and merger restrictions. Again, small firms seem to have played an important role in transmitting the effects of this deregulation to the real economy: the procyclical pattern in risk sharing is reduced most strongly in those states where small businesses account for a large share of income or employment.

This chapter is probably most closely related to Demyanyk, Ostergaard and Sørensen (2007), who showed that interstate income smoothing increased by around 15 percentage points *on average* following banking deregulation. Our results here suggest that the impact of banking deregulation on the variability of risk sharing is easily of equal importance quantitatively: banking deregulation has made consumption risk sharing much steadier over the cycle. Consumption risk is almost 20 percentage points higher than it used to be before deregulation *in the average recession*.

The reduction in the variability of interstate risk sharing that we document here is a potentially important source of the aggregate benefits from banking deregulation. Small firms are especially exposed to aggregate shocks (Gertler and Gilchrist (1994)) and it is therefore particularly important that they can borrow in recessions. Our findings support the view that banking deregulation has generally improved credit market access for small firms in recessions. There is a range of possible mechanisms through which these improvements could have been brought about. For example, banks could have extended credit lines (or modified credit contracts) for existing firms. Furthermore, they could have more readily provided credit to new firms, or they may have become more inclined to engage in relationship lending by not taking action against delinquent borrowers during recessions in the hope of being compensated in the next economic upswing.[10] We do not attempt to distinguish between these mechanisms in detail because we believe them to be complementary. All are consistent with our findings here.

This chapter is structured as follows: in the next section, we introduce the empirical framework and use it to document the procyclical nature of aggregate risk sharing. We also present our data and the details of the empirical implementation. In section 2.3, we discuss our empirical results. Section 2.4 concludes.

[10] We thank an anonymous referee for suggesting these examples.

2.2 Consumption risk sharing over the business cycle

We measure consumption risk sharing through panel regressions of the form:

$$\Delta \log \frac{C_t^k}{C_t^*} = \beta_U \left[\Delta \log \frac{GSP_t^k}{GSP_t^*} \right] + \tau_{Ut} + \delta_U^k + \alpha_U + \varepsilon_{Ut}^k, \tag{2.1}$$

where C_t^k is per capita consumption in federal state k in period t, GSP_t^k is state output ('gross state product') per head and the asterisk denotes the national per capita average of the respective variable. The terms τ_{Ut}, δ_U^k, α_U and ε_{Ut}^k stand for the time and state fixed effect, a constant and the error term respectively. In such a regression, we can think of the estimate of β_U as the amount of uninsured idiosyncratic output risk.

Regressions such as (2.1) by now have some tradition in both the micro- and the macroeconomic literature. Mace (1991), Cochrane (1991) and Townsend (1994) were the first to suggest regressions similar to (2.1) on household-level data as a test of the null of complete markets. Assume that each state is represented by a stand-in consumer and that we can associate changes in marginal utility with consumption growth (as is the case under constant relative risk aversion). Then, consumption growth should be independent of a region's business-cycle risks if financial markets are complete—regressions of the form (2.1) should yield a coefficient of zero. More recently, Asdrubali, Sørensen and Yosha (1996) have argued that the estimate of β_U may be more generally informative even if markets are incomplete: in panel regressions, β_U is regularly between 0 and unity, so that $1 - \beta_U$ can straightforwardly be interpreted as the share of the average region's idiosyncratic output risk that gets laid off in financial markets, whereas β_U is the portion of nondiversified idiosyncratic risk faced by the average region.

Estimates of β_U based on regional data reported in the literature tend to fall into the range between 0.2–0.3, therefore roughly a quarter to a third of a region's idiosyncratic output risk remains uninsured.[11] Based on our US state-level data set here, we obtain an estimate of just below 0.2. Such

[11] See Asdrubali et al. (1996), Crucini (1999).

estimates are typically based on panel regressions such as (2.1) and they do not generally allow for the possibility that the amount of risk sharing that a group of regions achieves may actually be varying over time.

Here, we argue that aggregate risk sharing varies over the business cycle. This could be because certain groups of households may find it harder to obtain consumption insurance in financial markets during recessions than during booms. In particular, many small firms rely heavily on access to bank loans, i.e. to credit markets, to smooth fluctuations in business cash flow.[12] Fluctuations in the availability of credit over the business cycle may therefore affect the degree of consumption risk sharing that the proprietors of small businesses and possibly also their employees can achieve. In this way, credit market restrictions may translate into fluctuations in aggregate risk sharing across regions.

Figure 2.1 presents the first evidence of business-cycle variation in interstate risk sharing: the figure plots a sequence of cross-sectional estimates of the coefficient β_U. To obtain this sequence, we run the regression (2.1) as a cross-sectional regression for each year in our sample period that ranges from 1964 to 2005:[13]

$$\Delta\widetilde{c}_t^k = \beta_U(t)\Delta\widetilde{gsp}_t^k + \tau_{Ut} + \varepsilon_{Ut}^k, \tag{2.2}$$

where $t = 1964, ..., \ 2005$, τ_{Ut} is the constant of the time t cross-sectional regression and ε_{Ut}^k is again the disturbance term. Here, and in the remainder of the chapter, we use lower-case letters with a tilde to denote logarithmic deviations from the US aggregate, so that $\Delta\widetilde{c}_t^k = \Delta\log\left[C_t^k/C_t^*\right]$ and $\Delta\widetilde{gsp}_t^k = \Delta\log\left[GSP_t^k/GSP_t^*\right]$. The solid line in Figure 2.1 represents the sequence $\{\beta_U(t)\}$, the dashed line is aggregate US real GDP growth. The sequence of risk-sharing coefficients has a mean of roughly 0.2 but it fluctuates

[12] It is well documented that credit market frictions tend to hit small firms harder than bigger firms that can issue their own bonds or may even be able to raise equity in stock markets. Gertler and Gilchrist (1994) showed that the credit channel of monetary policy has a much stronger impact on small firms than on bigger firms.

[13] Cross-sectional risk-sharing regressions go back to Cochrane (1991). Sequences of such regressions have previously been used by, e.g. Sørensen et al. (2007) to study the impact of financial globalization on international risk sharing.

dramatically over the cycle: $\beta_U(t)$ displays a negative correlation (-0.3) with aggregate GDP growth—the share of nondiversified state-level idiosyncratic risk increases in recessions and decreases in booms.

Closer inspection of Figure 2.1 reveals that the negative correlation between $\beta_U(t)$ and GDP growth is stronger in the first half of the sample period: for the period until 1984 it is -0.44, thereafter it drops to -0.13. We argue that this decline in the comovement of $\beta_U(t)$ with the business cycle is the result of banking deregulation at the state level during the 1970s and 1980s.[14] Figure 2.2 illustrates this point. It provides a Burns–Mitchell-type diagram that shows the typical behavior of $\beta_U(t)$ around the trough of an NBER recession, distinguishing between states that had already deregulated their bank branching restrictions and those that had not. The impact of deregulation is clearly visible: the behavior of $\beta_U(t)$ for the deregulated states is flat around recession events at a value of around 0.2. This value is almost identical to the estimate for the representative state when we estimate β_U from a panel regression such as (2.1). Conversely, for the group of states that are still regulating bank branching, the estimate of the fraction of unshared risk rises and peaks at 0.36 in the year of the business-cycle trough. Only a year after risk sharing increases again, $\beta_U(t)$ falls back to the nationwide long-term average of around 0.2. Hence, at the trough of the average NBER recession risk sharing was almost 20 (exactly: $16 = (0.36 - 0.2) \times 100$) percentage points below its long-run mean for those states that had not yet deregulated their bank branching restrictions.

The fact that business-cycle variation in risk sharing is dampened by bank deregulation may suggest that certain groups of firms and households that were previously unable to obtain credit in recessions may now have obtained better access to finance. Consistent with this conjecture, we find that the cycle in interstate risk sharing is driven mainly by those states where small businesses are particularly important. Figure 2.3 plots the sequence of $\beta_U(t)$, estimated once from the group of states with above-median incidence of small businesses and once from the lower half of the distribution. Over the period

[14]Note that 1984 not only marks the mid-point of our sample but also the year in which exactly half of all states had deregulated.

before the majority of states deregulated (1964–83) there is a pronounced negative correlation with GDP mainly for the group of states with lots of small businesses (−0.47), whereas for the other group this correlation was close to zero (−0.09).

2.2.1 Capturing time and state variations in interstate risk sharing

We now model business-cycle variation in interstate risk sharing more formally. To this end, we augment the basic panel regression (2.1) to include an interaction with aggregate, US-wide GDP growth:

$$\Delta \widetilde{c}_t^k = a_U \times \Delta \widetilde{gsp}_t^k + b_U \Delta gdp_t \times \Delta \widetilde{gsp}_t^k + \boldsymbol{d}_{Ut}^{k\prime} \mathbf{1} + \varepsilon_{Ut}^k, \tag{2.3}$$

so that $\beta_U(t) = a_U + b_U \times \Delta gdp_t$ can be interpreted as the fraction of unshared risk that now varies over time. Here, to save space, we have collected time and state fixed effects and the constant into the vector $\boldsymbol{d}_{Ut}^{k\prime} = \begin{bmatrix} \tau_{Ut} & \delta_U^k & \alpha_U \end{bmatrix}$ and $\mathbf{1}$ is a vector of ones. Regressions of this form are our main tool of analysis in the remainder of the chapter. If risk sharing increases in booms and decreases in recessions, we would expect $b_U < 0$. We pursue two specific hypotheses concerning the strength of this cyclical pattern in interstate risk sharing, i.e. on the magnitude of b_U: we argue that the procyclical pattern in risk sharing occurs mainly in states where small businesses are important. Second, we show that this cyclical pattern is dampened—in fact it almost vanishes—once a federal state liberalizes its bank branching laws.

To document these facts, we adopt two different approaches. A directly intuitive one is to split our sample by time (before/after deregulation) and into groups of states that differ by small business importance. A second, more formal approach augments equation (2.3) to allow risk sharing to vary across federal states and across time as a function of small business prevalence or deregulation as well as other characteristics. To capture this variation, we generalize the parameterization in (2.3) above:

$$\beta_U^k(t) = \Delta gdp_t \left[\mathbf{z}_t^{k\prime}\boldsymbol{b}_U\right] + \mathbf{z}_t^{k\prime}\boldsymbol{a}_U, \tag{2.4}$$

where $\boldsymbol{b}_U$, $\boldsymbol{a}_U$ are now coefficient vectors that load on the vector of state–time characteristics $\mathbf{z}_t^k$. The term $\mathbf{z}_t^{k\prime}\boldsymbol{b}_U$ corresponds to b_U above in that it captures the cross-state and time variation in the *sensitivity* of interstate risk sharing to aggregate business-cycle fluctuations. Conversely, the term $\mathbf{z}_t^{k\prime}\boldsymbol{a}_U$ is analogous to a_U and captures the effect of the state-time characteristics on the *long-term average* level of risk sharing. We partition $\mathbf{z}_t^{k\prime} = \left[1, \mathbf{x}_t', \mathbf{u}'^k, \mathbf{y}_t'^k\right]$, where $\mathbf{x}_t'$ is a vector of common time-varying characteristics and $\mathbf{u}'^k$ is a vector of time-invariant state-specific characteristics whereas $\mathbf{y}_t'^k$ collects all characteristics that vary across both time and state.

Plugging the specification for $\beta_U^k(t)$ into the basic panel risk-sharing regression (2.1), we obtain a set of interaction terms, $\Delta gdp_t\left[\mathbf{z}_t^{k\prime}\boldsymbol{b}_U\right] \times \Delta\widetilde{gsp}_t^k$ and $\mathbf{z}_t^{k\prime}\boldsymbol{a}_U \times \Delta\widetilde{gsp}_t^k$ respectively. The equation we effectively estimate then has the form:

$$\Delta\widetilde{c}_t^k = \Delta gdp_t \left[\mathbf{z}_t^{k\prime}\boldsymbol{b}_U\right] \times \widetilde{gsp}_t^k + \mathbf{z}_t^{k\prime}\boldsymbol{a}_U \times \widetilde{gsp}_t^k + \mathbf{y}_t^{k\prime}\boldsymbol{c}_U + \boldsymbol{d}_{Ut}^{k\prime}\mathbf{1} + \varepsilon_{Ut}^k \tag{2.5}$$

To avoid spurious effects on the higher order interaction terms between $\mathbf{z}_t^k$ and $\Delta\widetilde{gsp}_t^k$ this specification also includes first-order terms of those characteristics in $\mathbf{z}_t^k$ that vary both across time and state (i.e. $\mathbf{y}_t^k$). The vector $\boldsymbol{c}_U$ contains the associated regression coefficients.[15]

We now illustrate how we make use of this general framework. For example, to measure the impact of state deregulation on risk sharing we use dummy variables, SD_t^k, that are zero before and unity after a federal state has deregulated. Then letting $\mathbf{z}_t^{k\prime} = \left[1, SD_t^k\right]$ and recognizing that SD_t^k

[15]Potential first-order effects of the time-invariant regional ($\boldsymbol{u}^k$) and the common but time-varying elements ($\boldsymbol{x}_t$) in $\mathbf{z}_t^k$ will be picked up by the regional fixed effects (δ_U^k) and the time effects (τ_{Ut}) respectively, which we include in all regressions. Because our interest here is in the higher-order terms, i.e. in the impact of the characteristics $\mathbf{z}_t^{k\prime}$ on the slope coefficient on state output growth, this setup allows us to keep our regressions relatively parsimonious.

varies across time and states we obtain the following estimation equation:

$$\Delta\widetilde{c}_t^k = \left[b_{U0}\Delta gdp_t + b_{U1}\Delta gdp_t \times SD_t^k + a_{U0} + a_{U1}SD_t^k\right] \times \widetilde{gsp}_t^k + c_U SD_t^k + \boldsymbol{d}_{Ut}^{k\prime}\mathbf{1} + \varepsilon_{Ut}^k. \tag{2.6}$$

This particular equation is a differences-in-differences regression where deregulation is the treatment. As we will argue, deregulation weakens the covariation of risk sharing with GDP growth. In the above equation, this means that $b_{U0} < 0$ and $b_{U1} > 0$.

2.2.2 Channels of risk sharing

The coefficient β_U in (2.2) tells us how much of the idiosyncratic risk faced by the average federal state remains uninsured at time t. To better understand the nature of the frictions that drive time variation in $\beta_U(t)$, we also want to know *how* risk sharing is achieved. Asdrubali, Sørensen and Yosha (1996) have proposed a framework that allows us to explicitly identify three such channels of interstate risk sharing. Here we refer to these channels as income smoothing, fiscal transfers and consumption smoothing. The method by Asdrubali et al. (1996) is based on a decomposition of the cross-sectional variance of state output growth. To derive this decomposition, we rewrite state output growth tautologically as

$$\Delta\widetilde{gsp}_t^k = \left[\Delta\widetilde{gsp}_t^k - \Delta\widetilde{si}_t^k\right] + \left[\Delta\widetilde{si}_t^k - \Delta\widetilde{dsi}_t^k\right] + \left[\Delta\widetilde{dsi}_t^k - \Delta\widetilde{c}_t^k\right] + \Delta\widetilde{c}_t^k,$$

where si and dsi denote the logarithms of state-level income and disposable income respectively. We will discuss these income concepts shortly. Because all states face aggregate US-wide shocks that cannot be insured by definition, we again focus on the idiosyncratic, state-specific component of all variables and again denote it with a tilde. Taking the covariance with $\Delta\widetilde{gsp}_t^k$ on both sides and rearranging, we get

$$\beta_I + \beta_F + \beta_C = 1 - \beta_U,$$

where

$$\beta_I = cov(\Delta\widetilde{gsp}_t^k - \Delta\widetilde{si}_t^k, \Delta\widetilde{gsp}_t^k)/var(\Delta\widetilde{gsp}_t^k),$$
$$\beta_F = cov(\Delta\widetilde{si}_t^k - \Delta\widetilde{dsi}_t^k, \Delta\widetilde{gsp}_t^k)/var(\Delta\widetilde{gsp}_t^k),$$
$$\beta_C = cov(\Delta\widetilde{dsi}_t^k - \Delta\widetilde{c}_t^k, \Delta\widetilde{gsp}_t^k)/var(\Delta\widetilde{gsp}_t^k),$$
$$\beta_U = cov(\Delta\widetilde{c}_t^k, \Delta\widetilde{gsp}_t^k)/var(\Delta\widetilde{gsp}_t^k).$$

The four coefficients β_I, β_F, β_C and β_U provide us with a decomposition of the cross-sectional variance of state-specific output growth. The coefficient β_U is the same as in the basic regression (2.1) above and measures the fraction of a typical state output shock that remains unshared. Conversely, the coefficients β_I, β_F and β_C provide a breakdown into the contribution of the different channels to aggregate risk sharing.

We refer to the first channel, captured by β_I, as income smoothing. Whereas state output measures the quantity of goods and services produced in the state, state income captures the value of goods and services owned by the state's residents. The wedge between the two variables is therefore a measure of net factor income flows[16] and β_I measures to what extent these cross-state income flows systematically buffer a state's income against fluctuations in its output.

Fiscal transfers are a second channel that may provide risk sharing, e.g. through the progressivity of the tax system, through the social security system or through other direct payments. Net fiscal transfers account for the difference between state income (SI) and state disposable income (DSI). The coefficient β_F therefore indicates to what extent fiscal transfers allow residents of a federal state to smooth disposable income after a shock to state output.

[16] This is analogous to the difference between GDP and GNP in national income accounting. However, unlike GNP, state income does not reflect all income flows to a state. Specifically, it excludes income flows to legal entities (such as incorporated firms) if this income is not eventually disbursed to private households. Because GNP data is not available at the state level, it is therefore not possible to disentangle risk sharing through net interstate factor income flows from the intrastate income smoothing achieved through the balance sheets of legal entities.

Finally, a state's residents may save or dissave after observing their (disposable) income. We refer to this third channel as consumption smoothing, and we denote its contribution to overall risk sharing with β_C.

We call the vector $\boldsymbol{\beta}= [\beta_I, \beta_F, \beta_C, \beta_U]$ the pattern of risk sharing. At a practical level, this pattern can easily be estimated from the four regressions

$$\begin{aligned}
\Delta\widetilde{gsp}_t^k - \Delta\widetilde{si}_t^k &= \alpha_I + \beta_I \Delta\widetilde{gsp}_t^k + \delta_I^k + \varepsilon_{It}^k, \\
\Delta\widetilde{si}_t^k - \Delta\widetilde{dsi}_t^k &= \alpha_F + \beta_F \Delta\widetilde{gsp}_t^k + \delta_F^k + \varepsilon_{Ft}^k, \\
\Delta\widetilde{dsi}_t^k - \Delta\widetilde{c}_t^k &= \alpha_C + \beta_C \Delta\widetilde{gsp}_t^k + \delta_C^k + \varepsilon_{Ct}^k, \\
\Delta\widetilde{c}_t^k &= \alpha_U + \beta_U \Delta\widetilde{gsp}_t^k + \delta_U^k + \varepsilon_{Ut}^k,
\end{aligned} \tag{2.7}$$

where the coefficients δ_X^k capture state-specific fixed effects. Note that the last equation is just the basic risk-sharing regression (2.1). The set of regressions (2.7) assumes that $\boldsymbol{\beta}$ is time-invariant. However, it is now straightforward to extend our setup from the previous subsection to allow the whole pattern of risk sharing (and not only the amount of unshared risk, $\beta_U(t)$) to vary over time. Specifically, for any of the channels $X = I, F, C$ we can estimate equations of the form (2.3) or (2.5) in the same way as we do for $X = U$. All we have to do is replace consumption growth ($\Delta\widetilde{c}_t^k$) as a regressand with, in turn, $\Delta\widetilde{gsp}_t^k - \Delta\widetilde{si}_t^k$, $\Delta\widetilde{si}_t^k - \Delta\widetilde{dsi}_t^k$, and $\Delta\widetilde{dsi}_t^k - \Delta\widetilde{c}_t^k$ to characterize how the entire pattern of risk sharing varies across time and state.

2.2.3 Data

We use annual panel data for the 50 US states and for Washington DC for the period 1963–2005. To measure regional risk sharing on each level we employ an updated version of the data set compiled by Asdrubali et al. (1996). These data are compiled as follows.

State Output (GSP). Our measure of state-level output is state gross domestic product from the Bureau of Economic Analysis (BEA). A conceptually very similar series was formerly published as gross state product (GSP) but has been discontinued. To avoid confusion between state-level and aggregate (US) variables, we nonetheless continue to refer to state-level output as GSP in this chapter, and reserve the acronym GDP for US aggregate output.

State Income (SI). We use state personal income from the BEA, which is defined as the sum of earnings (wages and proprietors' income), profits (including interest and rent) distributed to the state's residents and state and federal nonpersonal taxes (including corporate taxes and indirect business taxes).

Disposable State Income (DSI). Disposable income is defined as state personal income plus federal transfers to individuals and federal grants to state governments minus federal nonpersonal taxes and contributions and federal personal taxes. Federal grants are provided by the United States Statistical Abstract, while federal personal taxes and transfers are available by state from the BEA.

State Consumption (C). State consumption is defined as the sum of private consumption and consumption by the state government. We follow Asdrubali et al. (1996) in constructing these data: state government consumption is state and local government expenditure less state and local transfers. Because private consumption at the state level is not available, we proxy it by retail sales, which we rescale by the ratio of aggregate US private consumption to aggregate US retail sales. Retail sales data by state have been updated from Asdrubali et al. (1996), and are available from the Statistical Abstract for the United States. They are sourced to Nielsen Claritas. For the years 1999 and 2003, however, these data are not available. We therefore proceed as follows: we obtain shopping center retail sales by state, which are available from the *Statistical Abstract of the United States* from 1990 to 2005. We then calculate the share of shopping center retail sales in total retail sales and interpolate this share (which is quite stable over time for individual states) for the two years in which no observations of total state retail sales were available. We then multiply shopping center retail sales for these years with the interpolated share to obtain total retail sales by state. Total retail sales by state are then rescaled uniformly across states so as to make sure that the sum across states complies with the US-wide total retail sales as published by the BEA.[17]

All these variables are turned into real per capita variables using population data by state deflated with the Price Index of Personal Consumption Expenditure (PCE).

We consider two measures of small business importance in a federal state.

Share of Proprietary Income (*shapi*). This is our primary measure. We calculate the share of proprietary income as the ratio of state proprietary income to state personal income. The data for both personal and proprietary income are from the BEA. Proprietary income is defined by the BEA as current-production income of sole proprietorships, partnerships, and tax-exempt cooperatives. It excludes dividends, monetary interest received by nonfinancial business, and rental income received by persons not primarily engaged in the real estate business.

Small Business Employment (SBE^k). This is the measure also used by Demyanyk et al. (2007). Small businesses are establishments with less than 100 employees. We measure small business employment as the number of people employed in small business establishments relative to total employment in a state in 1977. Unfortunately, this

[17] The adjustment factor is generally very close to one, suggesting that the approximation is quite reasonable. To check that none of our results depended on this interpolation, we also estimate all results in the chapter including a year dummy for 1999 and 2003 in our regressions. This does not make a noticeable difference to our results.

is the earliest date for which these data are available. The data were obtained from the Geospatial and Statistical Data Center, University of Virginia Library.

To model the dependence of aggregate risk sharing on the state of the business cycle we use the official real GDP growth series from the BEA and the peak and trough dates from the NBER business-cycle database. The impact of deregulation is proxied by an indicator variable. Specifically, we use data on intrastate banking deregulation from Demyanyk et al. (2007), Table 1. These go back to Kroszner and Strahan (1999) for the years after 1978 and Amel (1993) for the years before. Our state deregulation dummy SD_t^k is zero before deregulation and is one from the year in which intrastate deregulation took place in state k onwards, i.e. when the state permitted statewide branching by mergers and acquisitions.

2.2.4 Estimation issues

We estimate all of our specifications by both OLS and GLS. In the latter case, we first estimate the respective equation for the entire panel by OLS. Then we estimate the residual variance for each state. In a second step, we correct for heteroskedasticity by weighting observations with the inverse of this state-specific variance. Though our main results generally come out more strongly under GLS, we mainly present OLS results in the chapter, which give slightly higher weight to smaller states.

As a first guard against serial and cross-sectional dependence, all our specifications contain both time and region fixed effects. However, region fixed effects may be insufficient to control for more general forms of serial correlation at the regional level. As has been argued by Bertrand et al. (2004), the impact of serial correlation on the size of standard errors may be compounded in differences-in-differences specifications such as (2.6), where the regressands and the intervention dummy are often very persistent variables. As discussed in Petersen (2009), clustering is a quite general remedy in this setting because it does not require any specific assumptions about the functional form of serial dependence. Throughout the chapter, we therefore report standard errors clustered by state to control for serial dependence at the state level.[18]

2.3 Results

2.3.1 Cyclical patterns of interstate consumption risk sharing

Table 2.1 provides the results of the channels decomposition (2.7) where we parameterize the risk-sharing pattern $\boldsymbol{\beta}(t) = \begin{bmatrix} \beta_I(t), & \beta_F(t), & \beta_C(t), & \beta_U(t) \end{bmatrix}'$ as:

$$\beta_X(t) = a_X + b_X \Delta gdp_t, \tag{2.8}$$

for $X = I, F, C, U$. As Figure 2.1 suggested, risk sharing is much less dependent on GDP in the second half of our sample period. We therefore split our sample into pre- and post-1984 subperiods and report results for these subperiods separately.

Confirming the intuition from Figure 2.1, we find that interstate consumption risk sharing increases in booms and decreases in recessions (i.e. $\beta_U(t)$ is countercyclical): in the early period, a one percentage point increase in aggregate GDP growth would have led to an almost 4 percentage point increase in interstate consumption risk sharing ($b_U = -3.7$). However, we also find that this business-cycle dependence is limited mainly to the first period; in the second period, the estimate of b_U is much closer to zero (-0.98), and insignificant.

Turning to the patterns of risk sharing, we see that the main source of the procyclicality in risk sharing during the early period is consumption smoothing—our estimate of b_C is positive and significant. This procyclicality in consumption smoothing is partly offset by income smoothing ($\beta_I(t)$),

[18] We use an adaptation of the MATLAB routine 'cluster-reg.m', which is kindly made available on Ian Gow's web page: http://www.kellogg.northwestern.edu/faculty/gow/htm/GOT/matlab_routines.html.

which, interestingly, decreases in booms and rises in recessions.[19]

However, overall consumption smoothing ($\beta_C(t)$) is much more strongly procyclical than income smoothing ($\beta_I(t)$) is countercyclical. This impact on the procyclicality in aggregate risk sharing ($1 - \beta_U(t)$) is further reinforced through the fiscal channel, even though this effect is rather small and appears insignificant. Hence, fluctuations in access to consumption-smoothing possibilities are the main driver of the variation in interstate consumption risk sharing over the business cycle that we observe for the early period. In the second period, however, the cyclical pattern of income and consumption smoothing—though qualitatively similar—is much less pronounced: the associated coefficients b_C and b_I are now much closer to zero, and insignificant for both channels.

These findings are robust to alternative measures of the business cycle. In Panel B, we capture the business cycle using the official NBER peak and trough dates, again for the pre-1984 and post-1984 periods. Here, we also distinguish between recessions and booms to check for the possibility of asymmetries in the dependence of risk sharing on the cycle. The impact of the business cycle on interstate risk sharing is again only significant for the first period. It also seems somewhat stronger in recessions: the point estimate on the recession dummy suggests that, at the trough of the average recession in our sample, risk sharing was 20 percentage points below its long-run mean. Conversely, the peak indicator has a coefficient of only -0.12 and appears insignificant. Turning to the channels, we find that it is, again, the consumption-smoothing channel that accounts for this pattern: consumption smoothing seems to drop markedly in recessions. However, the evidence in favor of asymmetries is not overly strong: for both the unshared component and the consumption-smoothing channel, the coefficients on the

[19] Countercyclical income smoothing has also been observed by Agronin (2003), who suggested that the explanation might be purely mechanical: the share of small business owners' income (proprietary income) in US output is strongly procyclical. Because income from small businesses is not generally disbursed across state boundaries, say through profit or dividend payments (because the owner of a typical small business is likely to reside in the state), the share of income that flows across state borders to provide income smoothing decreases in booms.

expansion and recession indicators have absolute values that are not very far apart, and are oppositely signed throughout. Based on F-tests, we cannot reject the hypothesis that $b_{X0} + b_{X1} = 0$ for $X = U, C$. We return to the potential role of asymmetries when we discuss the impact of state-level banking deregulation below.

2.3.2 Importance of small businesses

We show next that the cyclical pattern of interstate risk sharing is determined mainly by those states where small firms are important.

As discussed in the data description, we employ two measures of small firm importance in a state (which we denote μ throughout). First, we use the share of proprietary income in state personal income ($\mu = shapi$). This measure specifically focuses on the importance for the regional economy of those households that actually own small businesses. Second, we use the share of total employment in small businesses of less than 100 employees ($\mu = SBE$). This measure emphasizes the role of small businesses as employers, and therefore in the local economy at large. One drawback here is that state-level time series for small business employment are only available from 1977.

For both the employment- (SBE) and income- ($shapi$) based measures, we split our sample of states into three equal-sized groups based on the importance of small businesses: high, middle or low.[20] We conduct this sample split based on pre-1975 sample averages (by state) for the proprietors' income measure, whereas we use the earliest available observation (1977) for the employment-based measure of small business importance. [21]

[20] This follows Demyanyk et al. (2007). We refer to these groups as high-, middle- and low-μ groups.

[21] We checked that it is indeed mainly the cross-sectional dispersion (and not time variation) in μ^k that drives the results. We parameterized many of the regressions below in a way that allows μ_1 to vary across both time and state. Our results are robust to these changes. We focus on pre-1975 (or in the case of small business employment, the earliest available, i.e. 1977) observations for two reasons. First, because, as we argue below, the dependence of aggregate risk sharing on the business cycle (and the role of small business importance for the strength of this dependence) is weaker after the deregulation wave of the mid 1980s. Secondly, the recession of the early 1980s has had a major impact on the ranking of some big states in terms of small business importance.

We then rerun the regression specification (2.8) for the unsmoothed component, $\beta_U(t)$, on each of these groups, again based on two subperiods. The results are in Panel A of Table 2.2: in the first period, the coefficient on the interaction term between aggregate GDP, Δgdp_t, and the growth of gross state product, $\Delta\widetilde{gsp}_t^k$, is significantly negative for those states where small businesses are important. For the other two groups of states, aggregate risk sharing does not seem to covary significantly with the business cycle. The results are qualitatively the same, irrespective of whether we use the income- or the employment-based measure of small business importance.[22]

Turning to the second period, however, we see that the cyclicality in risk sharing also vanishes for the high-μ states very much as it did when we considered all states.

We then explore to what extent the entire pattern of risk sharing is sensitive to the aggregate business cycle. We do so by parameterizing $\beta_X(t)$ as a function of the share of proprietary income in state personal income:

$$\beta_X(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t \times \left(\mu^k - \bar{\mu}\right) + a_{X0} + a_{X1}\left(\mu^k - \bar{\mu}\right),$$

where μ^k is the pre-1975 sample average of the share of proprietary income for state k and $\bar{\mu}$ stands for the cross-sectional mean of μ^k. Panel B of Table 2.2 presents the results for this specification. Again, the cyclical dependence of interstate risk sharing overall (i.e. of $1 - \beta_U(t)$) is stronger where small firms account for a large share of state income. Inspecting the channels of risk sharing, we see that this feature can again primarily be explained by the fact that the consumption-smoothing channel, $\beta_C(t)$, is particularly procyclical in states where μ_1 is high.

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[22] The coefficient a_U may decline as we move from the low- to the high-μ group, but this does *not* necessarily mean that the high-μ group shares more risk on average. The reason for this variation in a_U between the groups is mainly mechanical. We could equivalently estimate the specification $\beta_U(t) = \overline{a}_U^i + b_U^i(\Delta gdp_t - \overline{\Delta gdp})$, where $\overline{\Delta gdp}$ is the sample mean of aggregate GDP growth and i stands for the low-, middle- and high-μ groups respectively. Then $\overline{a}_U^i = a_U^i - b_U^i\overline{\Delta gdp}$ is the average amount of risk shared by group i. It is apparent that the group with the higher business-cycle sensitivity (lower b_U^i) to risk sharing will necessarily have a lower a_U^i, if the average amount of risk shared, $\overline{a}_U^i$, does *not* vary across groups. We do not report the demeaned specification, because this would make the interpretation of the coefficients on Δgdp less intuitive.

We conclude from these findings that the business-cycle dependence of interstate risk sharing is driven by the incidence of small businesses: not only is this dependence visible mainly in high-μ states. As the comparison over subperiods reveals, the dependence also disappears at roughly the same time, irrespective of whether we consider all states or just the high-μ states.

These stylized facts might, however, not be the result of a particular state having lots of small firms *per se*, but rather the outcome of small firms being concentrated in particular sectors of the economy. Furthermore, the importance of small firms in a state could itself be endogenously determined by risk-sharing opportunities. We address these issues in turn.

Robustness: controls for industrial structure, trends, etc.

In Table 2.3A, we repeat our regressions for $\beta_U(t)$, but now we also include a number of controls to check for robustness. Specifically, we control for a state's industrial structure through a sectoral specialization index of the form

$$IS^k = \sum_{s=1}^{S} \left\{ \frac{GSP_k^s}{GSP_k} - \frac{1}{K-1} \sum_{j=1, j\neq k}^{K} \frac{GSP_j^s}{GSP_j} \right\}^2 ,$$

where GSP_k^s / GSP_k is the share of value-added in sector s in the total value-added of state k. In our regressions, we use the estimates of IS^k provided in Table 1 of Kalemli-Ozcan, Sørensen and Yosha (2001) for both the one- and the two-digit industry classification levels. In our specification for $\beta_U(t)$ we then include both IS^k and its interaction with Δgdp. We also add a linear trend in the specification for $\beta_U(t)$ to control for the effect of other, gradual developments that could have affected interstate risk sharing over the sample period. We present the results obtained from both the OLS- and the GLS-based specifications.

Table 2.3A provides the findings for the two sub-periods 1963–84 and 1985–2005. More specialized regions tend to be better insured, a stylized fact first established by Kalemli-Ozcan, Sørensen and Yosha (2001, 2003). However, our finding that risk sharing fluctuates significantly with GDP, and that it does so more strongly in states with many small businesses, remains unaffected. Furthermore, again, this pattern is no longer significant in the second part of the sample.

Endogeneity of small business importance

The importance of small businesses could be simultaneously determined with risk-sharing opportunities in a state. In principle, the impact of risk sharing on small firms could work either way: good risk-sharing opportunities (including in particular the continued access to financial markets in bad times) may foster the creation and survival of small firms, implying that better risk sharing might lead to a higher incidence of small firms in a state. If this was the case, any potential simultaneity bias would work against us in the regressions we have presented in this chapter. We would then tend to underestimate any causal impact of small firms on the cyclicality of risk sharing. In principle, it is, however, also conceivable that small firms are most important in those states where risk sharing is lowest and most volatile. The reason might be that poor risk-sharing opportunities restrain firm growth, leading to a relatively high share of small firms in the state's economy.[23]

To ensure that our results are not unduly affected by endogeneity, we proxy small business importance using a remote lag of that variable. Plausibly, small business importance in the remote past is predetermined with respect to today's aggregate business-cycle shocks and, hence, with respect to current fluctuations in risk-sharing opportunities. We therefore rerun our previous specifications from Table 2.2 based on time averages by state of $\mu = shapi$ based on a period that ends well before our sample (the years

[23]We also attempted to gauge which of the two sources of bias, if any, would dominate in the data. To this end, we make use of our result, presented in the next subsection, that banking deregulation improves risk sharing by removing its cyclicality. Because banking deregulation can be thought of as an exogenous improvement in risk sharing, we can ask whether it increases or lowers the importance of small businesses in a state. We ran regressions of the long-term change of small firm importance in a state on the year in which the state deregulated. Though insignificant for most specifications, these regressions suggest that states that deregulated earlier tended to experience larger increases in small firm importance over the sample period. We conclude from this that if any significant simultaneity bias was present, it would lead us to underestimate the effect of small business importance on the cyclicality of risk sharing.

1950–55). Our results (presented in Table 2.3B) stay qualitatively the same. In the sample split, the coefficient on GDP growth is still much higher in the high-μ group than in the other two groups, and significant, though only at the 10 percent level. In the specification where the sensitivity of risk sharing to GDP growth is a linear function of μ, the interaction between GDP and μ remains clearly significant and correctly signed in the specification for $\beta_U(t)$, for both the income- and consumption-smoothing channels. Accounting for potential endogeneity of small firm importance does not affect our conclusion that risk sharing is more cyclical in high-μ states. And again, for both specifications, risk sharing varies significantly with the cycle only in the first half of the sample period.

2.3.3 The role of banking deregulation

We have shown that business-cycle fluctuations in risk sharing are much stronger in the first half of our sample than in the second. Our maintained hypothesis is that small firms' access to credit markets, particularly to bank loans, is a key determinant of the extent to which interstate risk sharing fluctuates over the aggregate business cycle. A major development that could have affected the availability of credit to small firms in our sample period is the gradual deregulation of the US banking market during the 1970s and 1980s. Until then, the US had a highly fragmented, localized banking system. State regulation generally prohibited the operation of out-of-state banks and also strongly limited bank branching within a state. In some states, banks were only allowed to operate a single branch.[24] From the point of view of economic theory, one would expect that the gradual lifting of this regulation would lead to considerable welfare gains through the formation of bigger banks and a better inter- and intrastate pooling of credit risk. Indeed, Jayaratne and Strahan (1996) showed that federal states that deregulated their banking markets earlier did eventually grow faster. They

[24] See Kroszner and Strahan (1999) for a succinct overview of the historical origins of this regulation and for a detailed account of the political and economic determinants of deregulation.

ascribed much of this growth gain to better access by small firms to credit. Morgan et al. (2004) found that deregulation has lowered the volatility of US state business cycles. In a recent important contribution, Demyanyk et al. (2007) demonstrated that income risk sharing increased because of state-level banking deregulation, and they also showed that this increase was more pronounced in states with many small businesses. While our work is related to Demyanyk et al.'s, our analysis differs in scope. We focus on the role of proprietary businesses and state-level banking deregulation for business-cycle *variability* in risk sharing rather than on the effect of deregulation on the *average* level of risk sharing. Specifically, we investigate to what extent banking deregulation has *steadied* interstate risk sharing.

The literature distinguishes between two dimensions of state-level deregulation: intrastate deregulation removed branching and merger restrictions for banks and bank holding companies that were domiciled in a state, while interstate deregulation allowed access to the local market by out-of-state banks and bank holding companies (often on a reciprocal basis) thus making the interstate pooling of bank funds possible. Our focus in this chapter is on intrastate deregulation.[25]

As explained in the data section, we exploit both the cross-sectional and intertemporal dimensions of deregulation by using a dummy variable SD_t^k, which becomes one from the year in which a state deregulates.

Table 2.4, Panel A shows the impact of banking deregulation on the cyclical pattern of risk sharing. Our specification for the risk-sharing pattern $\boldsymbol{\beta}^k(t)$, which we now estimate for the entire sample (1964–2005), is:

$$\beta_X^k(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t \times SD_t^k + a_{X0} + a_{X1}SD_t^k. \tag{2.9}$$

[25] Below we show that this focus on intrastate deregulation is justified: we run the regressions in this subsection based on the interstate deregulation indicator, finding that it is generally insignificant. We also ran a horse race between the intra- and interstate deregulation indicators, allowing both indicators to affect the cyclical dependence of risk sharing on GDP growth. Here, only *intrastate* deregulation had a significant impact on the variability of risk sharing over the cycle. Our results in this respect clearly tie in with the findings of Jayaratne and Strahan (1996), Morgan et al. (2004) and Demyanyk et al. (2007).

For both the income- and consumption-smoothing channels, the coefficients b_{X0} and b_{X1} have opposite signs and are significant. For both channels, we cannot reject the hypothesis $b_{X0} + b_{X1} = 0$ at conventional significance levels. For $\beta_U(t)$ we can equally not reject $b_{U0} + b_{U1} = 0$, even though b_{U1} taken alone would just come close to the 10 percent significance level.[26] These findings suggest that banking deregulation has virtually eliminated the business-cycle variation in aggregate risk sharing.

We again examine the robustness of our findings to alternative measures of the business cycle. Specifically, using the NBER peaks and troughs also allows us to investigate whether deregulation has had an asymmetric effect on risk sharing in booms and recessions. We estimate the following specification for the pattern of risk sharing:

$$\beta_X^k(t) = b_{X0}P_t + b_{X1}T_t + b_{X2}P_t \times SD_t^k + b_{X3}T_t \times SD_t^k + a_{X0} + a_{X1}SD_t^k, \quad (2.10)$$

where P_t and T_t are dummies indicating the NBER business cycle peaks and troughs respectively. The main feature of the results, presented in Panel B of Table 2.4, is that the deregulation dummy is strongly significant and negative in the interaction with the trough indicator. Conversely, the point estimate of the effect of deregulation at the peak of the business cycle is clearly insignificant. Deregulation seems to improve risk sharing mainly in recessions. In fact, the F-test that $b_{U1} + b_{U3} = 0$ does not reject the null. Hence, deregulation virtually eliminates the large fall in interstate risk sharing that was characteristic of recessions before deregulation.[27]

As we documented earlier, business-cycle variation in interstate risk sharing is driven by states where small firms are particularly important. There-

[26] In a GLS specification with clustered standard errors, b_{U1} is also significant at the 5 percent level. (t-stat of 2.6).

[27] The results in Table 4 do not generally indicate that banking deregulation increases consumption risk sharing on average: the coefficient a_{U1} is insignificant in both Panel A and Panel B. According to the results in Panel B, income risk sharing increases ($a_{I1} > 0$), which is consistent with Demyanyk et al. (2007), but consumption smoothing seems to decrease ($a_{C1} < 0$). This could suggest that there is a potentially interesting shift in the long-term pattern of risk sharing following banking deregulation. Our focus here is on the effect of deregulation on the cyclicality in risk sharing, and we do not explore this issue further.

fore, we would expect that banking deregulation removed the business-cycle sensitivity of risk sharing in these 'high-μ' states. This is exactly what we saw in Table 2.2: in the early part of the sample, the high-μ group is strongly exposed to fluctuations in GDP, whereas the low- and middle-μ groups are not. However in the later subsample, i.e. when most states had eventually deregulated, risk sharing no longer depended on GDP, even for the high-μ group.

In principle, it is conceivable that this pattern could be driven by other developments that coincided with the deregulation of bank branching restrictions. Not so: Table 2.5 shows that it is indeed the impact of banking deregulation that drives these results. We run the same regressions as in Table 2.2 A for the period 1964–84, but now we sort states into four categories: above/below median small business importance (high/low μ) and whether the state had deregulated by 1984 or not (late/early deregulation). Risk sharing fluctuated significantly with GDP growth only in high-μ states that were late deregulators. For all other groups, in particular for the high-μ/ early deregulation group, there is no significant link of $\beta_U(t)$ with aggregate GDP. Again, this holds true for both measures of small business importance.

Intra- vs. interstate banking deregulation[28]

The measure of deregulation we use in our analysis is the date of intrastate deregulation of banking services in a given state. Here, we examine whether this focus is justified: we compare to what extent intra- or interstate deregulation respectively have contributed to the shifting patterns of interstate risk sharing and, in particular, to what extent the two forms of deregulation have changed the variability of risk sharing over the cycle.

Table 2.6 displays results for each deregulation measure separately and for both measures together including both long-term (average level) and business-cycle effects on risk sharing. It is apparent that whilst interstate deregulation has mainly affected the average level of income and consumption

[28] This subsection is taken from Hoffmann and Shcherbakova-Stewen (2009).

smoothing, only *intrastate* deregulation has had a significant impact on the variability of risk sharing over the cycle. Again, this is true for all individual channels as it is for aggregate risk sharing, $1 - \beta_U(t)$. We think that these results have a highly intuitive interpretation: We would expect that longer-term improvements in interstate risk sharing for the average household can only be brought about by better access to credit from out-of-state. Allowing the formation of banks that operate and provide credit across state borders was exactly a key feature of *interstate* deregulation. *Intrastate* deregulation, on the other hand, has permitted banks to branch into other counties within the same state which is likely to have led to a cross-county, state-wide diversification of banks' credit risks. Such better pooling of credit risks may in turn have allowed to extend lines of credit to certain household groups and in particular to small firms whose cash flows and collateral value are highly correlated with local (county-specific) economic conditions. In particular, such a development may have improved small firms' ability to smooth consumption and income, in particular in aggregate cyclical downturns, when collateral values are low. Our results in this respect clearly tie in with the findings of Jayaratne and Strahan (1996), Morgan et al. (2004) and Demyanyk et al. (2007) who also ascribe the importance of deregulation for small businesses rather to the intrastate than to the interstate dimension.

2.3.4 Risk sharing, asset prices and collateral constraints[29]

As both an extension and robustness check we examine to what extent our results concerning the fluctuation of risk sharing with aggregate GDP could actually be driven by fluctuations in asset prices. Asset prices are highly correlated with the business cycle and the relation between $\beta_U(t)$ and aggregate GDP growth could just reflect what is actually a direct effect of asset prices on risk sharing. There are at least two channels through which asset prices could account for time-variation in the extent to which risk can be shared across state borders. First, asset prices fluctuations affect the

[29] This section draws on Hoffmann and Shcherbakova-Stewen (2009).

value of collateral and may therefore have an impact on credit market access. Secondly, asset price fluctuations, in particular of stock prices, could affect risk sharing over the cycle because they directly change the degree of interregional portfolio diversification: household holdings of the national stock market (e.g. through retirement savings plans) represent a claim to output in other federal states so that stock ownership brings interregional diversification.[30] When stock prices rise, the value of this diversified component of wealth increases relative to that of interregionally non-diversifiable components, such as labour income, housing or proprietary wealth. Therefore, interstate risk sharing could fluctuate with stock market valuations. To assess to what extent our results interact with time variation in collateral values, we turn to the recent study by Lustig and van Nieuwerburgh (2006) who have argued that the availability of housing collateral constrains interstate risk sharing in the United States. Possibly, the availability of housing collateral could also help explain why risk sharing fluctuates with aggregate GDP. In addition, given that small businesses face high non-insurable risk and may therefore face particularly severe credit constraints, the availability of housing collateral may be especially important for small business owners for whom personal and business finance are closely intertwined. To explore this nexus, we parametrize $\beta_U^k(t)$ as a function not only of Δgdp_t but also Lustig's and van Nieuwerburgh's indicator of housing collateral scarcity, the so-called my-residual[31] , and of various other controls, including interactions between Δgdp and μ, my and μ, as well as of a linear trend. Table 2.7 reveals that the business cycle dependence of risk sharing remains highly significant in all these specifications. As found by Lustig and van Nieuwerburgh (2006), housing collateral scarcity clearly matters for risk sharing, but

[30]This is certainly true if a household holds a diversified claim on the entire national stock market portfolio. But it is also possible if the household holds shares only of a limited number of companies. Provided these companies have operations outside the state of residence of the household, their stock is likely to represent claims to profits from many different federal states, thus providing interstate diversification to the household.

[31]Housing collateral scarcity, my_t, is the residual of a cointegrating relationship between housing wealth and income, rescaled to the interval between zero and one, with unity indicating highest scarcity (lowest availability of collateral). Further details are given in the data appendix.

it cannot explain away the dependence of interstate risk sharing on aggregate GDP growth. Interestingly, the effect of collateral scarcity on risk sharing is amplified in states with a high share of proprietary income, the interaction between μ and my has a large positive coefficient and is also significant in two specifications. Note also that once we consider the interaction of proprietorship with housing collateral scarcity, the aggregate housing collateral factor alone switches sign and generally ceases to have a significant impact on aggregate risk sharing. This result again suggests that small firms' access to credit seems to be crucial in understanding why risk sharing fluctuates over the business cycle. But the fact that the cyclical dependence of risk sharing holds up even once we control for a measure of collateral scarcity also underscores our point that housing collateral constraints are likely to be only one aspect of the story we focus on here. Table 2.8 explores the impact of stock market valuations on interregional diversification. To this end, we include a measure of asset price cycles as an additional interaction term in our regressions. We use Lettau's and Ludvigson's (2001) *cay*-residual, an econometric proxy of the consumption-wealth ratio that, as Lettau and Ludvigson have shown, is a very good indicator of the cyclical component in US stock markets. As is apparent from columns II-IV of Table 2.8, *cay* indeed helps explain fluctuations in aggregate risk sharing: risk sharing significantly increases when asset prices are high (*cay* is low) and decreases, when asset prices are low (cay is high). We think this is an interesting result in its own right, though we do not aim to explore it further in this chapter. Again, the inclusion of *cay* does not change our results with respect to the variation of risk sharing as a function of aggregate GDP, though. Another interesting feature that is noteworthy from Table 2.8 is that the interaction of Δgdp with a deregulation trend variable, $CumD_t$ – the cumulative fraction of states that had deregulated at a given date – is generally positive and significant, once again suggesting that the dependence of aggregate risk sharing on the GDP-cycle has decreased as deregulation has progressed. Interestingly enough, this very same trend does not seem to have changed the role of asset prices for fluctuations in risk sharing – the interaction between $CumD_t$ and cay_t is insignificant.

2.3.5 Monte Carlo evidence[32]

In this final subsection, we illustrate the robustness of our main results further by way of a Monte Carlo simulation: first, interstate risk sharing fluctuates more with the aggregate business cycle in states where small businesses account for a large share of economic activity. Secondly, intrastate bank branching deregulation has considerably weakened this business cycle dependence of risk sharing, presumably through its impact on small business access to finance. We ask whether the specific incidence of small businesses in a state and the specific date at which intrastate deregulation took place have a direct bearing on our results or whether these results could have been obtained by chance e.g. because they are driven by other developments that more or less coincided with the unfolding of deregulation across time and states.[33] We follow Bertrand et al. (2004) and Aghion et al. (2008) and randomly assign 'placebo' measures of small business importance (μ^k) and deregulation dates (SD_t^k) to each state by sampling 1000 draws from the empirical distribution of these variables. For both small business importance and deregulation dates, we then run two different exercises: in the first exercise, we run our specification on the placebo variable alone, asking in what percentage of cases it is more significant than the true variable. In the second exercise, we include both the placebo and the actual variable and we investigate in how many of our simulations the placebo and the actual variable respectively are individually significant. Panel A of Table 2.9 illustrates that the strength of the cyclical variation in $\beta_U(t)$ depends on small business prevalence. As is apparent, the interaction between the placebo measure of μ_1 (the share of proprietary income in state personal income) and aggregate GDP growth is more significant than in the real data in less than 3 percent of all cases. Conversely, if both the placebo and the actual measure are included, the interaction between GDP and the real measure is

[32]This section is based on Hoffmann and Shcherbakova-Stewen (2009).
[33] We thank Fabrizio Zilibotti for suggesting this exercise.

always significant, whereas it is only significant in around 10 percent of all cases for the placebo.

Panel B gives the corresponding results for intrastate deregulation: the interaction between the placebo deregulation date and aggregate GDP growth is more significant than between GDP and the real deregulation date in just 10 percent of cases. If the interactions of GDP with both the true and the placebo deregulation date are included, the coefficient on the true interaction is significant in 84 percent of all simulations, but only in 12 percent for the placebos. Note also that SD_t^k when not interacted with GDP, is almost never significant and only 12 percent of the placebo draws in the placebo-only specification would yield a t-statistics that is higher than the (insignificant) t-statistics on the true deregulation date. This once again highlights the relative importance of deregulation for the variability of interstate risk sharing: whereas, as we have seen above, deregulation seems to have had a major effect on the patterns of risk sharing (more income smoothing, as shown by Demyanyk et al. (2007) but also less consumption smoothing), its impact on the average level of aggregate consumption risk sharing appears insignificant. In as far as consumption risk sharing is concerned, the main impact of deregulation seems to have been to make risk sharing less variable over the business cycle.

The simulations in Panel C further illustrate that it is truly the interaction between small business importance and intrastate bank deregulation that is responsible for the reduced variability of risk sharing. Here, we sample from the joint distribution of μ and SD.[34] We then repeat the exercise from Table 2.5, panel B: based on their placebo assignments, we sort all states into four groups: high/low μ and early/late deregulation. The estimation period is again 1963-83. For the high-μ/late deregulation group we report the percentage of cases in which the respective coefficients are significant and

[34] As shown in Kroszner and Strahan (1999), deregulation did not occur randomly. Rather, states whith lots of small businesses tended to deregulate earlier. To account for this correlation, we do not draw μ and SD independently but from their joint distribution.

correctly signed. As is apparent the coefficients is almost never significant when based on the placebo: in only 0.3% and 0.2% of all cases for the income and employment based measures respectively. This underscores that business cycle fluctuations in a state's ability to share risk with other states are clearly not random but explained by the interaction of the two particular characteristics we focus on: the prevalence of small businesses and whether a state had deregulated its banking market or not.

2.4 Conclusions

In this chapter, we established that interstate risk sharing in the United States varies over the business cycle, with risk sharing increasing in booms and decreasing during downturns. This variation in aggregate risk sharing is quantitatively important. Over our sample period, the average state would share almost 80 percent of its business-cycle risk with other states. However, every percentage point increase in US-wide GDP growth increases interstate risk sharing by almost four percentage points, and in the trough of the average recession in our sample period, risk sharing was almost 20 percentage points below its mean.

We also identified a distinct pattern in *how* risk is shared over the business cycle. Interestingly, we find that income smoothing through capital income flows is countercyclical, whereas consumption smoothing through saving and dissaving at the household level is strongly procyclical. It is the latter effect that dominates, so that aggregate risk sharing is also strongly procyclical.

We conjecture that these patterns of risk sharing are determined by time variation in the ability of small firms to obtain credit. First, we demonstrate that the business-cycle dependence of risk sharing is much more pronounced in states where small firms are particularly prevalent. Second, we show that the liberalization of state-level bank branching and holding legislation in the US has significantly affected this pattern: banking deregulation virtually removed the dependence of aggregate risk sharing on the business cycle, and this reduction in cyclical dependence occurred primarily in states where small businesses account for a large share of income or employment.

At a theoretical level, banking deregulation may affect risk sharing in two ways: first, better interstate pooling of credit risk may lead to more risk sharing on average. Second, if firms and households face collateral and borrowing constraints, the extent to which consumption risk sharing is possible may be sensitive to the phase of the business cycle. Our results are consistent with the view that this second effect is particularly important: banking deregulation seems to have improved credit market access for small firms most when it is most needed—in cyclical downturns.

Appendix

Table 2.1: Risk Sharing and the Business Cycle

The table reports the results of the panel OLS regressions $\Delta x_t = \beta_X(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Xt}^{k\prime}\mathbf{1} + \varepsilon_{Xt}^k$ with $x_t = \widetilde{gsp}_t^k - \widetilde{si}_t^k$, $\widetilde{si}_t^k - \widetilde{dsi}_t^k$, $\widetilde{dsi}_t^k - \tilde{c}_t^k$, $\tilde{c}_t^k$ for $X = I$, F, C, U respectively. $\beta_X(t)$ is defined as indicated in the panel headings. P_t and T_t denote the peak and trough dates from the NBER business cycle database. $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and a constant (estimates not reported). The data are annual from 1963 to 2005. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**). Standard errors are based on clustering by state.

	(I)	(F)	(C)	(U)
Panel A: $\beta_X(t) = a_X + b_X\Delta gdp_t$				
1964-1984				
a_X	0.54**	0.02	0.19**	0.25**
	(9.38)	(0.39)	(2.11)	(3.35)
b_X	-2.91**	0.49	6.13**	-3.70**
	(-2.66)	(1.15)	(2.33)	(-2.12)
1985-2005				
a_X	0.67**	0.21**	-0.07	0.19**
	(5.23)	(2.12)	(-0.64)	(2.07)
b_X	0.57	-3.42	3.83	-0.98
	(0.25)	(-1.11)	(1.07)	(-0.49)
Panel B: $\beta_X(t) = a_X + b_{X0}P_t + b_{X1}T_t$				
1964-1984				
a_X	0.41**	0.07**	0.40**	0.12**
	(5.79)	(3.28)	(5.23)	(2.26)
b_{X0}	0.01	-0.12	0.23)	-0.12
	(0.04)	(-1.15)	(1.67	(-1.11)
b_{X1}	0.13	0.00	-0.33**	0.20**
	(1.17)	(0.06)	(-1.98)	(2.36)
1985-2005				
a_X	0.70**	0.08**	0.06	0.16**
	(9.03)	(3.07)	(0.68)	(3.64)
b_{X0}	-0.30**	0.05	0.08	0.18
	(-3.72)	(0.34)	(0.46)	(1.06)
b_{X1}	0.12**	0.14	-0.09	-0.17
	(2.00)	(1.00)	(-0.40)	(-1.54)

F-Test (p-value) of H_0: Symmetry of expansion and recession (1964-1984)

H_0 :	F-Test=1.58	F-Test=0.86	F-Test=0.49	F-Test=0.80
$b_{X0}+b_{X1}=0$	(0.21)	(0.36)	(0.48)	(0.37)

Table 2.2: Risk Sharing and Small Business Importance

Panel A reports the results of the panel OLS regression $\Delta\widetilde{c}_{k,t} = \beta_U(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Ut}^{k\prime}\mathbf{1} + \varepsilon_{Ut}^k$ for two periods: pre-1984 and post-1984. $\beta_U(t)$ is defined as $\beta_U(t) = a_U + b_U\Delta gdp_t$. The states are split into groups according to the importance of small businesses ("low", "middle", "high") μ^k. Panel B reports the results of the panel OLS regressions $\Delta x_t = \beta_X^k(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Xt}^{k\prime}\mathbf{1} + \varepsilon_{Xt}^k$ with $x_t = \widetilde{gsp}_t^k - \widetilde{si}_t^k$, $\widetilde{si}_t^k - \widetilde{dsi}_t^k$, $\widetilde{dsi}_t^k - \widetilde{c}_t^k$, $\widetilde{c}_t^k$ for $X = I$, F, C, U respectively for two periods: pre-1984 and post-1984. $\beta_X^k(t)$ is defined as indicated in the panel heading. μ^k denotes time-series means of the share of proprietary income for every state k in the period from 1964 to 1975 and $\bar{\mu}$ is the cross-sectional mean of μ^k. $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and the constant (estimates not reported). The data are annual from 1963 to 2005. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**). In both panels standard errors are based on clustering by state.

Panel A

$\mu^k = shapi$ ($share\ of\ proprietary\ income$ 1964-1975)

	1964-1984			1985-2005		
	low	middle	high	low	middle	high
a_U	0.16*	0.36**	0.29**	0.09	0.17	0.16
	(1.92)	(3.55)	(3.97)	(0.57)	(1.53)	(1.00)
b_U	-0.70	-1.52	-6.39**	2.37	0.87	-3.41
	(-0.43)	(-0.67)	(-2.56)	(0.82)	(0.25)	(-0.84)

$\mu^k = SBE$ ($Small\ Business\ Employment\ in$ 1977)

	1964-1984			1985-2005		
	low	middle	high	low	middle	high
a_U	0.49**	0.20**	0.15*	0.36	0.31	0.08
	(5.47)	(2.08)	(1.95)	(1.27)	(1.64)	(1.60)
b_U	-4.65	1.05	-3.40	-2.00	-3.60	-0.29
	(-1.44)	(0.62)	(-1.62)	(-0.23)	(-0.69)	(-0.14)

Panel B

$$\beta_X^k(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t(\mu^k - \bar{\mu}) + a_{X0} + a_{X1}(\mu^k - \bar{\mu})$$

	1964-1984				1985-2005			
	(I)	(F)	(C)	(U)	(I)	(F)	(C)	(U)
b_{X0}	-0.88	0.09	3.17**	-2.38**	1.33	-3.24	2.66	-0.75
	(-0.94)	(0.29)	(2.07)	(-2.14)	(0.56)	(-1.16)	(0.85)	(-0.38)
b_{X1}	-0.01	-3.28	67.01**	-63.71**	-189.08**	-95.11	299.52**	-15.33
	(-0.00)	(-0.59)	(2.45)	(-3.16)	(-3.02)	(-1.09)	(3.66)	(-0.28)
a_{X0}	0.54**	0.02	0.20*	0.24**	0.66**	0.20**	-0.06	0.19**
	(16.49)	(0.46)	(1.88)	(3.71)	(4.83)	(2.24)	(-0.51)	(1.98)
a_{X1}	-3.96**	0.97	1.87	1.12	2.46	3.71	-4.33	-1.84
	(-4.91)	(1.58)	(1.22)	(1.11)	(0.99)	(1.34)	(-1.30)	(-0.72)

Table 2.3A: Robustness I - Industrial Structure

The table reports the results of the panel GLS/OLS regressions $\Delta\widetilde{c}_{k,t} = \beta^k_U(t)\Delta\widetilde{gsp}^k_t + \boldsymbol{d}^{k\prime}_{Ut}\mathbf{1} + \varepsilon^k_{Ut}$, where $\beta^k_U(t) = \boldsymbol{b}^{\prime}_U\mathbf{z}^k_t \times \Delta gdp_t + \boldsymbol{a}^{\prime}_U\mathbf{z}^k_t$ and where $\mathbf{z}^k_t$ contains the state characteristics listed in the first column. IS^k are 1- or 2-digit specialization indices. μ^k denotes time-series means of the share of proprietary income for every state k in the period from 1964 to 1975 and $\bar{\mu}$ is the cross-sectional mean of μ^k. $Trend$ is a linear trend variable. $\boldsymbol{d}^k_{Xt}$ contains time and state fixed effects and the constant (estimates not reported). The data are annual from 1963 to 2005. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**). Standard errors are based on clustering by state.

$\mathbf{z}^k_t$		1-digit	2-digit	1-digit	2-digit	1-digit	2-digit	1-digit	2-digit
		1963-1984				1985-2005			
interactions $\boldsymbol{z}^k_t \times \Delta gdp_t$									
$1 \times \Delta gdp_t$	b_{U0}	-2.81	-7.44**	-3.20**	-5.37**	-3.51	-3.54	-2.15	-1.32
		(-1.48)	(-3.09)	(-2.35)	(-3.17)	(-0.98)	(-0.81)	(-0.67)	(-0.35)
$(\mu^k - \bar{\mu}) \times \Delta gdp_t$	b_{U1}	-40.54**	-24.03	-43.75**	-37.43**	-13.79	-13.85	-17.39	-25.85
		(-2.65)	(-1.22)	(-3.13)	(-2.44)	(-0.50)	(-0.45)	(-0.56)	(-0.74)
$IS^k \times \Delta gdp_t$	b_{U2}	-0.03	0.37*	0.03	0.25	0.40	0.23	0.34	0.10
		(-0.18)	(1.75)	(0.20)	(1.62)	(1.25)	(0.96)	(1.03)	(0.40)
level factors									
(1)	a_{U0}	0.37**	0.55**	0.42**	0.53**	0.41**	0.39**	0.32**	0.29**
		(5.50)	(8.21)	(7.65)	(8.41)	(3.14)	(2.43)	(3.03)	(2.34)
$(\mu^k - \bar{\mu})$	a_{U1}	0.31	-0.49	0.24	-0.28	-0.96	-0.94	-0.71	-0.46
		(0.51)	(-0.73)	(0.45)	(-0.48)	(-0.91)	(-0.78)	(-0.66)	(-0.37)
IS^k	a_{U2}	-0.02**	-0.02**	-0.03**	-0.02**	-0.04**	-0.02*	-0.03**	-0.01
		(-3.08)	(-5.23)	(-4.33)	(-5.10)	(-3.08)	(-1.80)	(-2.82)	(-1.30)
$Trend$		0.01	0.00	0.01	0.00	-0.01	-0.00	-0.01**	-0.01
		(0.68)	(0.29)	(0.82)	(0.60)	(-1.07)	(-0.74)	(-2.20)	(-1.64)
Method		OLS	OLS	GLS	GLS	OLS	OLS	GLS	GLS

Table 2.3B: Robustness II - Lagged Small Business Importance

Panel A reports the results of the panel OLS regression $\Delta\widetilde{c}_{k,t} = \beta_U(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Ut}^{k\prime}\mathbf{1} + \varepsilon_{Ut}^k$ for two periods: pre-1984 and post-1984. $\beta_U(t)$ is defined as $\beta_U(t) = a_U + b_U\Delta gdp_t$. The states are split into groups according to the importance of small businesses ("low", "middle", "high") μ^k. Panel B reports the results of the panel OLS regressions $\Delta x_t = \beta_X^k(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Xt}^{k\prime}\mathbf{1} + \varepsilon_{Xt}^k$ with $x_t = \widetilde{gsp}_t^k - \widetilde{si}_t^k$, $\widetilde{si}_t^k - \widetilde{dsi}_t^k$, $\widetilde{dsi}_t^k - \widetilde{c}_t^k$, $\widetilde{c}_t^k$ for $X = I$, F, C, U respectively for two periods: pre-1984 and post-1984. $\beta_X^k(t)$ is defined as indicated in the panel heading. μ^k denotes time-series means of the share of proprietary income for every state k in the period from 1950 to 1955 and $\bar{\mu}$ is the cross-sectional mean of μ^k. $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and the constant (estimates not reported). The data are annual from 1963 to 2005. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**). In both panels standard errors are based on clustering by state.

Panel A

$\mu^k = shapi$ (*share of proprietary income* 1950-1955)

	1964-1984			1985-2005		
	low	middle	high	low	middle	high
a_U	0.15*	0.38**	0.28**	0.10	0.20*	0.14
	(1.87)	(3.81)	(3.39)	(0.63)	(1.71)	(1.21)
b_U	0.09	-4.00	-5.22*	2.05	1.34	-4.01
	(0.06)	(-1.53)	(-1.73)	(0.69)	(0.42)	(-1.14)

Panel B

$$\beta_X^k(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t \times (\mu^k - \bar{\mu}) + a_{X0} + a_{X1}(\mu^k - \bar{\mu})$$

	1964-1984				1985-2005			
	(I)	(F)	(C)	(U)	(I)	(F)	(C)	(U)
b_{X0}	-0.86	-0.12	4.14**	-3.15**	0.28	-3.92	4.91	-1.27
	(-0.94)	(-0.36)	(3.19)	(-2.70)	(0.12)	(-1.14)	(1.28)	(-0.76)
b_{X1}	-7.03	-2.38	44.95**	-35.54**	-36.09	-23.20	80.84**	-21.56
	(-0.81)	(-0.81)	(3.05)	(-2.89)	(-0.97)	(-1.00)	(2.10)	(-1.21)
a_{X0}	0.50**	0.04	0.21**	0.26**	0.65**	0.23**	-0.07	0.19**
	(12.52)	(1.14)	(2.25)	(4.82)	(6.36)	(2.05)	(-0.60)	(2.43)
a_{X1}	-1.93**	0.73**	0.49	0.70	-0.45	0.81	-0.50	0.14
	(-3.97)	(1.96)	(0.45)	(1.11)	(-0.30)	(1.09)	(-0.36)	(0.15)

Table 2.4: Risk Sharing, Banking Deregulation and the Business Cycle (OLS)

The table reports the results of the panel OLS regressions$\Delta x_t = \beta_X^k(t)\Delta\widetilde{gsp}_t^k + c_X SD_t^k + \boldsymbol{d}_{Xt}^{k\prime}\mathbf{1} + \varepsilon_{Xt}^k$ with $x_t = \widetilde{gsp}_t^k - \widetilde{si}_t^k$, $\widetilde{si}_t^k - \widetilde{dsi}_t^k$, $\widetilde{dsi}_t^k - \widetilde{c}_t^k$, $\widetilde{c}_t^k$ for $X = I, F, C, U$ respectively. $\beta_X(t)$ is defined as indicated in the panel heading. SD_t^k is the intrastate deregulation dummy, which is 1 from the year of state k's intrastate deregulation onwards. P_t and T_t are dummies for the peak and trough dates from the NBER business cycle database. $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and the constant (estimate not reported). c_X is not reported. The data are annual from 1963 to 2005. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**). In both panels standard errors are based on clustering by state.

	(I)	(F)	(C)	(U)
Panel A: $\beta_X^k(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t \times SD_t^k + a_{X0} + a_{X1}SD_t^k$				
b_{X0}	-4.29**	0.30	10.07**	-6.08**
	(-3.59)	(1.06)	(3.90)	(-3.08)
b_{X1}	4.44**	0.59	-9.24**	4.21
	(2.56)	(0.71)	(-2.31)	(1.53)
a_{X0}	0.55**	0.09**	0.01	0.35**
	(9.74)	(6.17)	(0.09)	(5.90)
a_{X1}	0.08	-0.08	0.13	-0.13
	(1.32)	(-1.57)	(1.30)	(-1.44)
Panel B: $\beta_X^k(t) = b_{X0}P_t + b_{X1}T_t + b_{X2}P_t \times SD_t^k + b_{X3}T_t \times SD_t^k + a_{X0} + a_{X1}SD_t^k$				
b_{X0}	-0.15	-0.00	0.29**	-0.13
	(-1.47)	(-0.16)	(2.03)	(-1.59)
b_{X1}	0.24**	-0.00	-0.53**	0.30**
	(2.76)	(-0.23)	(-3.65)	(3.46)
b_{X2}	0.16	-0.21	-0.04	0.09
	(0.82)	(-1.29)	(-0.21)	(0.53)
b_{X3}	-0.29**	0.01	0.53**	-0.25**
	(-2.74)	(0.29)	(3.02)	(-2.40)
a_{X0}	0.41**	0.10**	0.35**	0.14**
	(7.95)	(9.07)	(3.84)	(2.93)
a_{X1}	0.24**	-0.03	-0.24**	0.03
	(3.26)	(-1.10)	(-3.10)	(0.54)
F-Test (p-value) of H_0: Deregulation removes cyclicality in risk sharing ...				
in booms				
H_0: $b_{X0}+b_{X2}=0$	F-Test=0.08 (0.78)	F-Test=0.08 (0.77)	F-Test=0.08 (0.78)	F-Test=0.10 (0.75)
in recessions				
H_0: $b_{X1}+b_{X3}=0$	F-Test=0.29 (0.59)	F-Test=1.12 (0.29)	F-Test=0.11 (0.74)	F-Test=0.48 (0.49)

Table 2.5: Risk Sharing, Banking Deregulation and Small Businesses

The table reports the results of the panel OLS regression for the period 1964-1984 $\Delta\widetilde{c}_{k,t} = \beta_U(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Ut}^{k\prime}\mathbf{1} + \varepsilon_{Ut}^k$, where $\beta_U(t) = a_U + b_U\Delta gdp_t$. The states are split into four categories: above/below median small business importance and whether the state had already deregulated by 1984 or not (early/late deregulation). $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and the constant (estimates not reported). The data are annual from 1963 to 1984. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**). Standard errors are based on clustering by state. "Obs." denotes the number of observations in the respective category.

	$\mu^k = shapi$ (*share of proprietary income* 1964-1975)			
	early deregulation		late deregulation	
	low μ^k	high μ^k	low μ^k	high μ^k
a_U	0.14*	0.37**	0.42**	0.26**
	(1.82)	(2.44)	(4.58)	(3.63)
b_U	-0.82	-6.69	-2.42	-6.38**
	(-0.53)	(-1.55)	(-1.11)	(-2.91)
Obs.	378	126	147	420
	$\mu^k = SBE$ (*Small Business Employment in* 1977)			
	early deregulation		late deregulation	
	low μ^k	high μ^k	low μ^k	high μ^k
a_U	0.47**	0.12*	0.30**	0.23**
	(4.47)	(1.85)	(3.04)	(3.19)
b_U	-2.15	-1.97	-3.03	-5.41**
	(-0.46)	(-0.89)	(-1.58)	(-2.30)
Obs.	315	189	210	357

Table 2.6: Risk Sharing, Intra- and Interstate Banking Deregulation

The table reports the results of the panel OLS regressions$\Delta x_t = \beta_X^k(t)\Delta\widetilde{gsp}_t^k + c_X SD_{k,t} + \boldsymbol{d}_{Xt}^{k\prime}\mathbf{1} + \varepsilon_{Xt}^k$ with $x_t = \widetilde{gsp}_t^k - \widetilde{si}_t^k$, $\widetilde{si}_t^k - \widetilde{dsi}_t^k$, $\widetilde{dsi}_t^k - \widetilde{c}_t^k$, $\widetilde{c}_t^k$ for $X = I$, F, C, U respectively. $\beta_X(t)$ is defined as indicated in the panel heading. $SD_{k,t}$ is the intra- $(SD_{k,t}^1)$ or interstate $(SD_{k,t}^2)$ deregulation dummy, which is 1 from the year of state k's intra- or interstate deregulation onwards. SD_t^k $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and the constant (estimate not reported). c_X is not reported. The data are annual from 1963 to 2005. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**).

$$\beta_X^k(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t \times SD_{k,t} + a_{X0} + a_{X1}SD_{k,t}$$

	(I)	(F)	(C)	(U)	(I)	(F)	(C)	(U)
	$(SD_{k,t})$=$(SD_{k,t}^1)$				$(SD_{k,t})$=$(SD_{k,t}^2)$			
b_{X0}	-4.71**	0.37	10.97**	-6.63**	-3.55**	1.11**	6.63**	-4.18**
	(-8.24)	(0.76)	(7.62)	(-4.99)	(-8.55)	(3.12)	(6.30)	(-4.29)
b_{X1}	3.25**	1.14*	-9.13**	4.74**	0.12	-0.27	1.01	-0.85
	(4.10)	(1.71)	(-4.57)	(2.57)	(0.09)	(-0.26)	(0.32)	(-0.29)
a_{X0}	0.49**	0.09**	0.18**	0.25**	0.51**	0.03**	0.28**	0.19**
	(25.18)	(5.24)	(3.62)	(5.45)	(36.58)	(2.40)	(7.86)	(5.83)
a_{X1}	0.15**	-0.09**	-0.01	-0.05	0.26**	0.01	-0.37**	0.10
	(5.92)	(-4.27)	(-0.08)	(-0.91)	(8.43)	(0.45)	(-4.77)	(1.39)

$$\beta_X^k(t) = b_{X0}\Delta gdp_t + b_{X1}\Delta gdp_t \times SD_{k,t}^2 + b_{X2}\Delta gdp_t \times SD_{k,t}^1 + a_{X0} + a_{X1}SD_{k,t}^2 + a_{X2}SD_{k,t}^1$$

	(I)	(F)	(C)	(U)
b_{X0}	-4.72**	0.36	10.97**	-6.61**
	(-8.38)	(0.76)	(7.67)	(-4.98)
b_{X1}	-1.57	-0.69	5.71*	-3.46
	(-1.20)	(-0.61)	(1.72)	(-1.12)
b_{X2}	3.05**	1.12	-9.37**	5.20**
	(3.68)	(1.58)	(-4.46)	(2.66)
a_{X0}	0.48**	0.08**	0.19**	0.24**
	(25.23)	(5.13)	(3.85)	(5.39)
a_{X1}	0.22**	0.07**	-0.43**	0.14*
	(6.69)	(2.36)	(-5.11)	(1.81)
a_{X2}	0.06**	-0.11**	0.15**	-0.10
	(2.25)	(-4.94)	(2.19)	(-1.52)

Table 2.7: Robustness check: Risk Sharing, Proprietary Income and Housing Collateral

The table reports the results of the panel GLS/OLS regressions $\Delta\widetilde{c}_{k,t} = \beta^k_U(t)\Delta\widetilde{gsp}^k_t + \boldsymbol{d}^{k\prime}_{Ut}\mathbf{1} + \varepsilon^k_{Ut}$, where $\beta^k_U(t) = \boldsymbol{b}^{\prime}_U\mathbf{z}^k_t \times \Delta gdp_t + \boldsymbol{a}^{\prime}_U\mathbf{z}^k_t$ and where $\mathbf{z}^k_t$ contains the aggregate characteristics listed in the first column. my_t is real estate wealth, that is defined in detail in the data appendix. μ^k denotes time-series means of the share of proprietary income for every state k and $\bar{\mu}$ is the cross-sectional mean of μ^k. $Trend$ is a linear trend variable. $\boldsymbol{d}^k_{Xt}$ contains time and state fixed effects and the constant (estimates not reported). The data are annual from 1963 to 1998. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**).

$\mathbf{z}^k_t$	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VII)	(VIII)	(IX)
interactions $\boldsymbol{z}^k_t \times \Delta gdp_t$										
$1 \times \Delta gdp_t$	-3.42**	-4.15**	-3.89**	-3.27**	-3.80**	4.20	3.57	2.55	-2.82	-2.50
	(-3.46)	(-4.35)	(-4.07)	(-3.31)	(-3.99)	(1.47)**	(1.24)	(0.83)	(-0.75)	(0.66)
$(\mu^k - \bar{\mu}) \times \Delta gdp_t$						-71.41	-64.63**	-66.95**	-71.48**	-66.58**
						(-2.83)	(-2.52)	(-2.19)	(-2.36)	(-2.16)
$(my_t) \times \Delta gdp_t$									9.21**	8.17
									(2.67)	(2.28)
level factors										
(1)	0.41**	0.41**	0.39**	0.69**	0.70**	0.46**	0.43**	0.42**	0.45**	0.46**
	(4.31)	(4.10)	(3.83)	(3.96)	(3.66)	(2.31)	(2.18)	(1.98)	(2.13)	(2.14)
$(\mu^k - \bar{\mu}) \times (my_t)$				6.60**	6.67*	4.78	4.71	4.19	3.19	3.56
				(2.34)	(1.90)	(1.64)	(1.62)	(1.22)	(0.92)	(1.02)
$(\mu^k - \bar{\mu})$	-1.93**	-2.07**	-1.98**	-4.89**	-5.17**	-2.30	-2.28	-2.18	-1.41	-1.69
	(-2.91)	(-2.54)	(-2.41)	(3.21)	(-2.73)	(-1.25)	(-1.24)	(-1.00)	(-0.65)	(-0.77)
(my_t)	0.01	0.21**	0.23**	-0.61**	-0.41	-0.48	-0.43	-0.18	-0.24	-0.25
	(0.07)	(2.08)	(2.31)	(-1.99)	(-1.19)	(-1.52)	(-1.36)	(-0.53)	(-0.70)	(-0.71)
Trend	no	no	yes	yes	yes	no	yes	yes	no	yes
Method	OLS	GLS	GLS	OLS	GLS	OLS	OLS	GLS	GLS	GLS

Table 2.8: Robustness check: Risk Sharing and Asset Prices

The table reports the results of the panel GLS/OLS regressions $\Delta\widetilde{c}_{k,t} = \beta_U^k(t)\Delta\widetilde{gsp}_t^k + \boldsymbol{d}_{Ut}^{k\prime}\mathbf{1} + \varepsilon_{Ut}^k$, where $\beta_U^k(t) = \boldsymbol{b}_U^{\prime}\mathbf{z}_t^k \times \Delta gdp_t + \boldsymbol{a}_U^{\prime}\mathbf{z}_t^k$ and where $\mathbf{z}_t^k$ contains the aggregate characteristics listed in the first column. cay_t is demeaned consumption-wealth ratio. cay_t is deviation from cointegrating relationship between consumption, asset wealth and labor income. $CumD_t$ is defined as the fraction of states in the sample, that have deregulated. $\boldsymbol{d}_{Xt}^k$ contains time and state fixed effects and the constant (estimates not reported). The data are annual from 1963 to 1998. T-statistics in parentheses. Significance at the 10% (5%) level is indicated by *(**).

$\mathbf{z}_t$	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
interactions $\boldsymbol{z}_t^k \times \Delta gdp_t$								
$1 \times \Delta gdp_t$	-3.81**		-3.86**	-3.84**	-4.59**	-4.55**	-4.67**	-4.61**
	(-5.15)		(-4.08)	(-4.04)	(-4.70)	(-4.68)	(-4.77)	(-4.71)
$(cay_t) \times \Delta gdp_t$				-20.86				
				(-0.16)				
$(CumD_t) \times \Delta gdp_t$					8.78**	10.24**	10.32**	11.06**
					(3.11)	(3.43)	(3.33)	(3.31)
level factors								
(1)	0.33**	0.27**	0.32**	0.32**	0.30**	0.19**	0.29**	0.19**
	(11.43)	(10.93)	(11.22)	(10.86)	(9.97)	(6.51)	(9.68)	(6.34)
cay_t		14.32**	12.07**	12.86**	13.42**	8.98**	11.48**	8.20**
		(5.94)	(4.99)	(2.29)	(5.49)	(3.68)	(3.91)	(2.90)
$(cay_t) \times CumD_t$							7.05	3.55
							(1.17)	(0.54)
Method	GLS	GLS	GLS	GLS	GLS	OLS	GLS	OLS

Table 2.9: Robustness check: Monte Carlo Simulations

Table reports results from the Monte Carlo simulations for the share of proprietary income μ_k (Panel A), intrastate banking deregulation SD_t^k (Panel B), and both the share of proprietary income μ_k and intrastate banking deregulation SD_t^k (Panel C). We take 1000 random draws from the empirical distribution of these variables for each specification. In panels A and B the first row presents the percentage of cases where estimated coefficients in the regressions with 'placebo' variable are more significant than true ones. The second row reports the percentage of cases where estimated coefficients are individually significant. Superscript $\cdot^P$ denotes a 'placebo' variable and its associated coefficient. Panel C reports the percentage of cases for which the coefficient on $\Delta gdp \times \Delta\widetilde{gsp}_t^k$ is significant and correctly signed for the high μ/late deregulation group. See notes to table 2.5 for details on how these groups are formed.

Panel A: Simulated μ_k

$$\beta_U^k(t) = b_{U0}\Delta gdp_t + b_{U1}^P \Delta gdp_t \times \mu_k^P + a_{U0} + a_{U1}^P \mu_k^P$$

Percentage of simulated t-stats larger than t-stats from real data

$\widehat{b_{U0}}$	100%	$\widehat{b_{U1}^P}$	3%	$\widehat{a_{U1}^P}$	50%

$$\beta_U^k(t) = b_{U0}\Delta gdp_t + b_{U1}\Delta gdp_t \times \mu_k + b_{U1}^P \Delta gdp_t \times \mu_k^P + a_{U0} + a_{U1}\mu_k + a_{U1}^P \mu_k^P$$

Percentage of significant t-stats

$\widehat{b_{U1}}$	100%	$\widehat{b_{U1}^P}$	10%	$\widehat{a_{U1}}$	0%	$\widehat{a_{U1}^P}$	28%

Panel B: Simulated SD_t^k

$$\beta_U^k(t) = b_{U0}\Delta gdp_t + b_{U1}^P \Delta gdp_t \times SD_{k,t}^P + a_{U0} + a_{U1}^P SD_{k,t}^P$$

Percentage of simulated t-stats larger than t-stats from real data

$\widehat{b_{U0}}$	14%	$\widehat{b_{U1}^P}$	10%	$\widehat{a_{U1}^P}$	12%

$$\beta_U^k(t) = b_{U0}\Delta gdp_t + b_{U1}\Delta gdp_t \times SD_{k,t} + b_{U1}^P \Delta gdp_t \times SD_{k,t}^P + a_{U0} + a_{U1}SD_{k,t} + a_{U1}^P SD_{k,t}^P$$

Percentage of significant t-stats

$\widehat{b_{U1}}$	85%	$\widehat{b_{U1}^P}$	12%	$\widehat{a_{U1}}$	0.5%	$\widehat{a_{U1}^P}$	23%

Panel C: Simulated μ_k and SD_t^k

$$\beta_U^k(t) = b_{U0}\Delta gdp_t + a_{U0} \; \textit{for states with high } \mu_k \textit{ and late deregulation}$$

Percentage of cases for which coefficient on Δgdp_t negatively signed and more significant

$\mu^k = \textit{Share of proprietary income}$		$\mu^k = \textit{Small Business Employment}$	
$\widehat{b_{U0}}$	0.3%	$\widehat{b_{U0}}$	0.2%

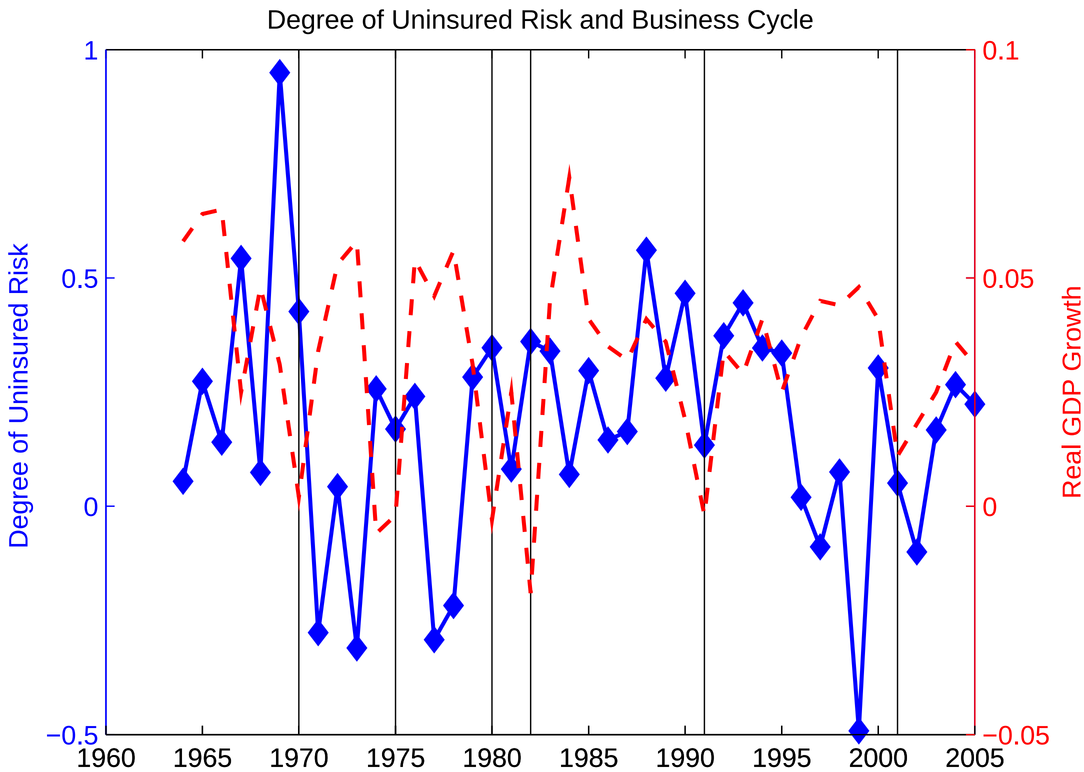


FIGURE 2.1: The blue, solid line is the coefficient $\beta_U(t)$ of the sequence of cross-sectional regressions $\Delta\tilde{c}_t^k = \beta_U(t)\Delta\widetilde{gsp}_t^k + \tau_t + \varepsilon_t^k$ for $t = 1964...2005$. The red, dashed line is US GDP growth. Vertical lines indicate NBER business cycle troughs.

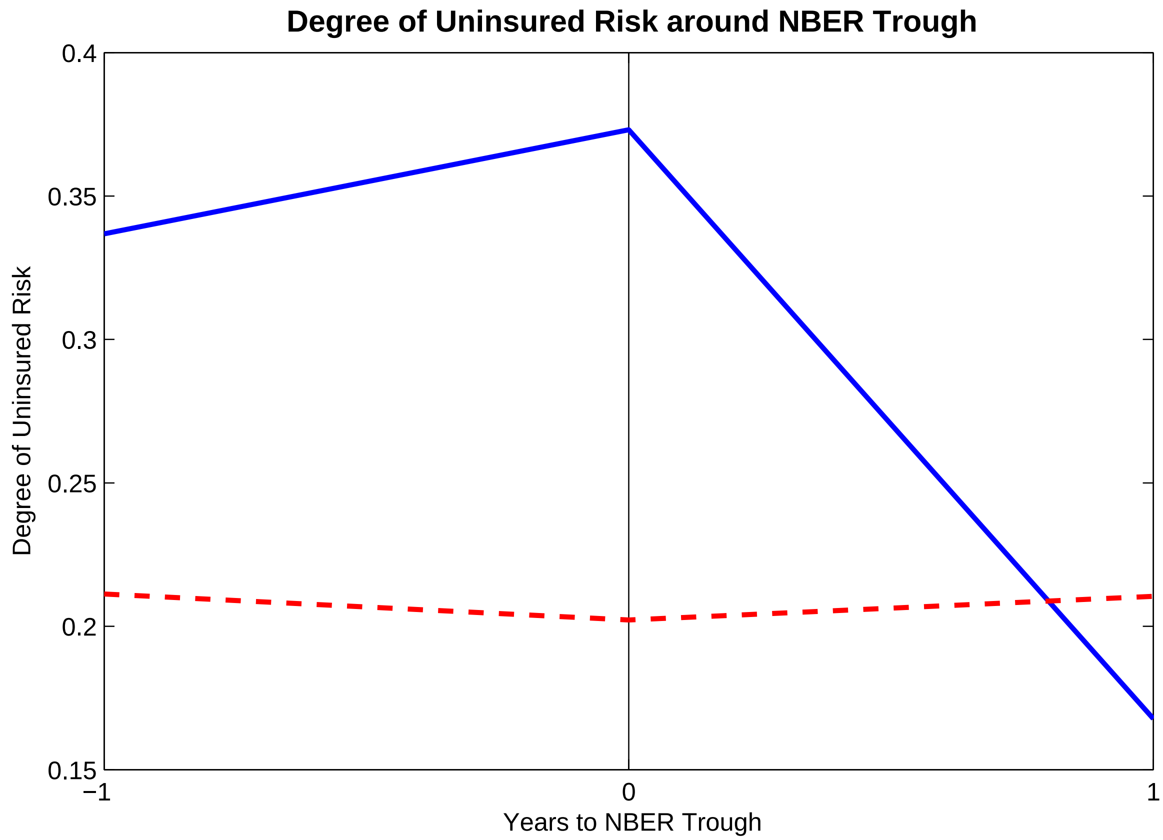
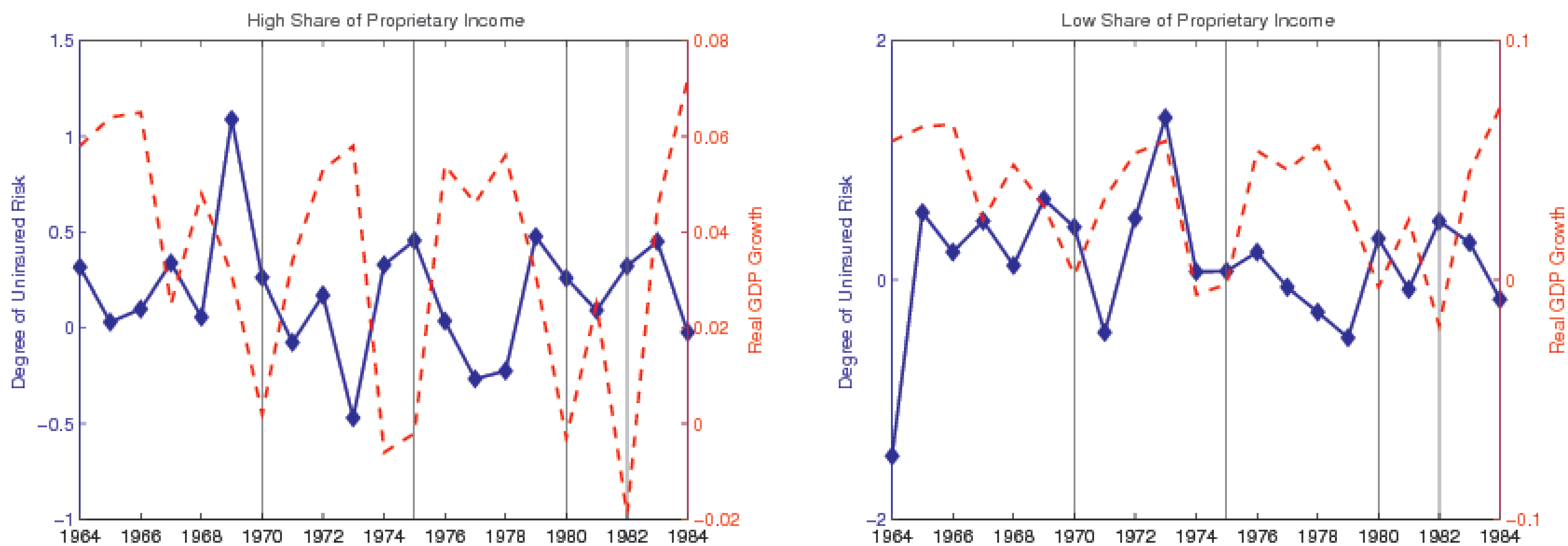


FIGURE 2.2: Burns-Mitchell diagram of the fraction of unshared risk around NBER recession troughs, distinguishing between states that have not yet (blue, solid line) and those that have already (red, dashed line) deregulated. This fraction was estimated as follows: Let $I_{trough} = \left\{ t^1_{trough} .... t^N_{trough} \right\}$ define the set of NBER trough dates. Altogether, our sample contains $N = 6$ NBER recession troughs that define a total of $306 = 6 \times 51$ (50 states+ Washington D.C.) state-recession events. At each trough date, we split the 51 state-recession events into two groups, according to whether state k had deregulated at that trough $t \in I_{trough}$ or not. We then pool state-recession events (by group) across all troughs and run the cross-sectional regressions $\Delta \widetilde{c}^k_{t+l} = \beta_U(l) \Delta \widetilde{gsp}^k_{t+l} + \tau_{t+l} + \varepsilon^k_{t+l}$ for $l = -1, 0, 1$ and $t \in I_{trough}$, once for deregulated and once for not-yet-deregulated state-recession events. In this way, we obtain the typical time profile of risk sharing for each group one year before a trough ($l = -1$), in the year of trough itself ($l = 0$) and one year after ($l = 1$) . The plot gives the estimated $\beta_U(l)$ for the two groups.



Panel A Panel B

FIGURE 2.3: Risk sharing over the business cycle for states with above median (left, Panel A) and below median (right, Panel B) small business importance 1964-84 (i.e. before the bulk of bank deregulations took place). In each panel, the blue, solid line is the coefficient $\beta_U(t)$ of the sequence of cross-sectional regressions $\Delta\widetilde{c}_t^k = \beta_U(t)\Delta\widetilde{gsp}_t^k + \tau_{Ut} + \varepsilon_{Ut}^k$. The red, dashed line is US GDP growth. Vertical lines indicate NBER business cycle troughs.

Chapter 3

Determination of Equity Home Bias: An Empirical Analysis[35]

3.1 Introduction

The feature of international diversification behavior that investors allocate most of their portfolios to domestic securities when investing into the international markets is well-known and widely-documented. There are numerous theoretical models that attempt to find the determinants of the home bias in equities. This literature can be partitioned into two broad strands: the first one applies a portfolio-balance approach using international CAPM. It is, however, by its nature a partial equilibrium approach, with the limitations that this entails. This literature suggests that international portfolio choice is determined by costs associated with cross-border investment[36] or by the allocation of consumption expenditures across countries due to different consumer preferences, inflation risks and deviations from purchasing power parity (PPP). This heterogeneity in individuals' consumption allocation and evaluation of returns gives rise to real exchange rate (RER) fluctuations. Thus, the portfolio theory literature suggests home bias in asset market to be a result of the hedging motive against RER fluctuations.

The second, more recent, strand of the literature exploits general equilib-

[35]This chapter draws on Stewen (2010a).

[36]See e.g. Tesar and Werner (1995), Hasan and Simaan (2000), Mussa and Goldstein (1993)

rium (GE) models and, thus, chooses equilibrium portfolio endogenously. For a considerable bulk of this literature the main source of the portfolio home bias is given by non-tradability in the goods sector.[37] The GE literature suggests trade costs as another potential source for the lack of international diversification.[38] However, there is still no consensus among the theoretical models that try to reconcile features of international portfolio holdings in a general equilibrium framework. The models differ in the modeling procedures, specifications, parameter values and consequently in the mechanisms that explain home bias. Though, the commonality of them is their disability to reconcile the shares of home equity holdings observed in the real world.

However, a considerable number of these models - mainly partial equilibrium models - ascertain inflation hedging or RER hedging term as an inherent determining part of the equilibrium portfolio holding. This term captures the relationship between RER changes of two countries (or, if there is no nominal exchange rate changes, relative inflation), and equity excess returns of a country relative to another country, i.e. relative returns. The idea of the inflation hedging motive as a source of observed home bias was initiated by Adler and Dumas (1983), who argued that *"every investor in the world holds a combination of the universal logarithmic portfolio..."* and *"his personalized hedge portfolio which constitutes the best protection against inflation"* (p.21). Then, according to the partial equilibrium portfolio choice literature, every investor would invest into the asset that gives him the highest return when domestic inflation is high. Given the striking feature of domestically concentrated portfolio investment, we then should expect home assets to be the best hedge against domestic inflation, which would be the

[37] Dellas and Stockman (1989), Baxter, Jerman and King (1998) and others.

[38] There is a large literature that tries to rationalize the portfolio home bias through a variety of frictions aside from frictions on the goods market both in partial and general equilibrium frameworks: costs in financial markets (Lewis (1996), Amadi and Bergin (2006), Coeurdacier and Guibaud (2006)), price stickiness in product markets (Engel and Matsumoto (2006, 2009a, 2009b)), asymmetric information in financial markets (Gehrig (1993), Jeske (2001), Hatchondo (2005) and van Nieuwerburgh and Veldkamp (2007)), liquidity or short sales constraints (Michaelides (2003), DeMarzo, Kaniel and Kremer (2004), Julliard (2004)) and weak investor rights concentrating ownership among insiders (Kho et. al. (2006)).

case when domestic returns and domestic inflation are positively correlated. Or in other words, when comparing home to foreign country, positive RER changes should be accompanied by positive domestic excess returns relative to foreign ones.

In contrast, the aforementioned GE models have still not reached a consensus on the sign of the correlation of domestic returns and inflation. Though, the sign of this correlation is essential for the computation of equilibrium portfolio holdings because it can result in *home* or *foreign* equity bias. Nevertheless, while testing and/or calibrating their models, the GE literature does not generally take into account, if at all, asset pricing implications of the model and also - even more important - the correlation of exchange rate changes and excess returns that could well be observed empirically. The sign of "RER hedging term" depends rather on the nature of underlying shocks or parameter values.

Given the importance of RER hedging in the portfolio determination and certain inattentiveness of recent theoretical models with regard to it, the main purpose of this chapter is to provide a robust empirical evidence on the correlations of RER changes and excess returns. In so doing, I estimate these correlations for industrial and emerging countries for the period 1982-2007 and sub-periods. To the best of my knowledge, it is the first attempt to compute correlation coefficients for a comprehensive number of countries for different recent time periods.

The only related empirical work so far is the paper by van Wincoop and Warnock (2010) (thereafter, VWW) which seeks to reconcile empirical regularities on home bias in the GE approach. They explicitly calculate the correlation of asset returns with RER fluctuations for the United States versus the rest of the world. VWW argue that the computed RER hedging term is very low and would in turn imply portfolio home bias close to zero.

In contrast, my results for industrial countries are rather mixed. While for non-EMU countries inflation differentials and excess returns are positively and highly significantly correlated, the EMU members exhibit correlation coefficients that are not significantly different from nil. This result suggests that RER hedging motive should not play any role in portfolio composition of EMU investors and vice versa for other industrial investors.[39] Including emerging countries into the sample does not change the picture a lot with respect to industrial countries.[40] Moreover, nearly all emerging countries exhibit a positive and significant correlation of RER changes and relative returns. This is an interesting and appealing result. It reveals that if investors beyond the EMU care about RER hedging, they may act differently (compared to EMU investors) when investing into equities. Then, one of the reasons for the observed home bias in equities should be - at least for non-EMU countries - the demand for RER hedging.

This chapter makes two further important contributions. First, I ask the question whether these estimated correlations of RER changes and excess returns, that are supposed to be a good measure for RER hedge, are able to explain the observed home equity holdings. The answer to this question is an unambiguous yes: I find a very robust and significant effect of RER hedging motive on domestic equity holdings. On the one hand, positive correlation of excess returns with RER changes increases holdings of domestic equities. The effect of RER hedging on domestic equity holdings is more pronounced among emerging countries in a longer-run perspective. On the other hand, domestic equity holdings of industrial non-EMU countries depends negatively on RER hedging term in the short-run.

According to Obstfeld and Rogoff (2006) and Coeurdacier (2009), trade costs, or trade barriers, in goods market can explain home bias in equity holdings. Consequently, we should expect trade openness, that is an inverse of trade costs, to be one of the determinants for the domestic equity holdings: with higher trade costs in goods markets domestic markets are more sheltered from competition with foreign countries which makes their returns less volatile and domestic investors are more eager to hold domestic assets.

[39] This highly significant correlation for non-EMU and the lack of significance for EMU countries could be driven by nominal exchange rate fluctuations. It might also be the case that being in a monetary union does not force investors to care about RER hedging and rather concentrate on returns volatility.

[40] Correlations are computed for each country k relative to the rest of the world (RoW), where RoW consists of all countries in the sample exept of country k. Including emerging countries into the sample changes RoW, and thus, could also change the correlation coefficient of each country with RoW.

Thus, higher trade openness should induce lower domestic equity holdings. I pursue this hypothesis in my work here and find that trade openness is more important in the determination of domestic equity holdings in the short-run than in the longer-run and especially for industrial countries. Furthermore, my results from panel regression analysis reveal that RER hedging motive is more pronounced in the countries that are more open to trade. Thus, we may suggest that when economy becomes more open to trade and competition with other countries increases, risk sharing through terms of trade decreases so that incentive to share risk via foreign ownerships increases and the share of domestic equities in portfolio falls.

Finally, I analyze how important financial openness is in the portfolio formation. My last contribution is to show that there is a substantial heterogeneity in the role of financial openness in explaining the variation in domestic equity holdings: in particular, EMU countries feature to some extent unexpected relation between financial openness and home equity holdings. More financially open economies within the EMU hold *more* domestic equities. This result contradicts the prevailing reasoning line.

The structure of the rest of this chapter is as follows. Section 2 lays out the conceptual framework for the study, while section 3 addresses empirical issues. So in section 3.1, I describe the data sources and how the main variables are constructed. The analysis of the computed RER hedging terms is presented in section 3.2. In section 3.3, I examine the central empirical question of the chapter and ask whether computed RER hedging terms help to explain home bias. This examination is conducted in two ways: cross-sectional and panel estimations. Section 3.4 provides the insight on the impact of trade and financial openness on portfolio determination. Section 4 concludes the chapter.

3.2 The van Wincoop and Warnock model

The theoretical motivation for this chapter draws heavily on the model proposed by van Wincoop and Warnock (2008) who develop a partial equilibrium portfolio choice model. The distinctive feature of their model is that it could be easily nested within GE models. But the rest of a GE model is not relevant here because RERs and asset returns are observed and taken directly from the data. Therefore they do not need to be determined by market clearing conditions and any other optimality conditions.

Consider a static one-period framework, in which the only assets are equities issued in both countries with nominal gross returns R_j, $j = 1, 2$. The countries are identical and there is no differentiation between different types of equity within a country. All asset returns, prices and inflation rates are denoted in terms of the currency of country 1. The initial wealth of country n's investors $\bar{W}(n)$ can be invested with a fraction $\mu_j(n)$ in country j's equity. Given inflation rate $e^{\pi(n)}$, the real portfolio return in country n is then

$$R^p(n) = (\mu_1(n)R_1 + (1 - \mu_1(n))R_2)e^{-\pi(n)} \ .$$

Country n's investors maximize the expected CRRA consumption utility from the end of period wealth $C(n) = R^p(n) \cdot \bar{W}(n)$

$$E\left[\frac{C(n)^{1-\gamma}}{1-\gamma}\right]$$

with respect to the share of portfolio invested at home,μ_j. The first order condition for this optimal portfolio is given by

$$E(R^p(n))^{-\gamma}(R_1 - R_2)e^{-\pi(n)} = 0 \ .$$

Taking logs and adopting a first-order log-lionization of the real portfolio return yields[41]

$$r^p(n) = \mu_1(n)r_1 + (1 - \mu_1(n))r_2 - \pi(n) \ .$$

[41] Lower-case letters denote log variables.

After assuming normality of log returns and inflation and making some rearrangements we obtain the following optimal portfolio:

$$\mu_1(n) = \lambda + \frac{\gamma-1}{\gamma}\frac{cov(r_1-r_2,\pi(n))}{var(r_1-r_2)}$$

It is obvious that the share of domestic equities in the optimal portfolio is determined by two terms. The first $\lambda = \frac{E(r_1-r_2)+0.5(var(r_1)-var(r_2))+\gamma cov(r_2-r_1,r_2)}{\gamma var(r_1-r_2)}$ is the "world market portfolio" or logarithmic portfolio according to the diversification motive, which depends on first and second moments of asset returns. The second term describes the hedging motive against domestic inflation fluctuations. When $\gamma=1$, investors have logarithmic preferences and are not concerned about domestic inflation, so that the optimal portfolio is given by λ. The share of domestic assets in portfolio would increase only if domestic inflation and the relative domestic returns are positively correlated. That would mean that domestic investors prefer domestic assets since they give higher returns when the domestic inflation is higher and the RER appreciates.

The optimal portfolio derived by VWW in a partial equilibrium framework bears a striking resemblance to the equilibrium equity portfolio originated from Coeurdacier's (2009) general equilibrium model. In his specific model domestic home equity holdings depend on the market portfolio (which is $\frac{1}{2}$ in his case) and on the "hedging component" due to RER fluctuations:

$$\mu = \frac{1}{2}\left[1 + \frac{\gamma-1}{\gamma}\frac{cov(\hat{R},R\hat{E}R)}{var(\hat{R})}\right],$$

where $\hat{R}$ denotes excess of home returns over foreign ones, $R\hat{E}R$ is real exchange rate changes.

Both models suggest that covariance of RER changes and excess returns is the key determinant of domestic equity holdings in the absence of PPP. That is why I concentrate here on the computation of this covariance term for a wide range of countries, and thus provide a basis for the parameterization in GE models. This in turn will allow the GE literature to verify whether their models are consistent with the evidence on the properties of RERs and excess returns. These new insights may point to potential adjustments to be made in order to better explain home bias.

3.3 Empirical analysis

3.3.1 Data

To compute the correlation of RER changes and excess return I use monthly data for the period 1982-2007. Equity indexes converted into dollars include capital gains and dividends as of month end and are from MSCI Barra. Consumption price index (CPI) and nominal exchange rate (NER) are measured in national currency and national currency per US dollar respectively and are from the IMF's IFS database. Stock market capitalization (SMC) for a country is measured as the value of publicly traded equity listed on the stock market exchanges and the data are from Standard & Poor's Global Stock Markets Factbook 1995, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006.

The excess return for country k, er_k is calculated as the difference between the equity return in country k and the rest of the world (RoW) equity return. Formally,

$$er_k = r_k^{NC_k} - r_{RoW,k}^{NC_k} ,$$

where $r_k^{NC_k}$ is the return on country k's equity expressed in currency of country k. $r_{RoW,k}^{NC_k}$ is the RoW's equity return in terms of national currency of country k and is computed as a weighted sum of returns in the sample except of return of country k. The weights (w_j) are given by the relative stock market capitalization of each country in the total stock market capitalization of the given sample. Finally, to obtain the returns in the national currency of country k, I multiply the dollar equity indexes ($P_k^{\$}$) of each country by the nominal exchange rate (national currency per US dollar) and then take the first difference of their logs. So that

$$r_{RoW,k}^{NC_k} = \sum_{j \neq k}^{N} r_j^{NC_k} \cdot w_j \ ,$$

$$w_j = \frac{SMC_j}{\sum_{j \neq k}^{N} SMC_j} \ ,$$

$$r_j^{NC_k} = \Delta log(P_j^{\$} \cdot NER^{j,\$}) \ .$$

The RER change of country k is given by country k's relative inflation, i.e. inflation of country k minus inflation of the RoW (i.e. relative inflation), both expressed in currency of country k,

$$\Delta q_k = \pi_k^{NC_k} - \pi_{RoW,k}^{NC_k} \ .$$

Inflation is calculated as a log first difference of CPI. To obtain CPI in country j in terms of country k's currency I convert it first to US dollar by dividing it by nominal exchange rate of country j and then multiply it by nominal exchange rate of country k. The weighting scheme is identical to the scheme used for returns.

$$\pi_i^{NC_k} = \Delta log(CPI_k^{NC_k}) \ ,$$

$$CPI_j^{NC_k} = CPI_j^{NC_j} \frac{NER_{k,\$}}{NER_{j,\$}} \ ,$$

$$CPI_{RoW,k}^{NC_k} = \sum_{j \neq k}^{N} CPI_j^{NC_k} \cdot w_j \ .$$

As a measure for the share of domestic assets in portfolio I use the share of domestic equity in portfolio (μ). The data on foreign equity holdings, domestic equity held by foreigners are from Lane and Milesi-Ferretti (2007) that have been updated up to 2007. "World market capitalization" is the sum of the stock market capitalizations of the developed and emerging stock markets. The total equity portfolio of country k is market capitalization plus foreign equity held minus the amount of country k's equity held by foreigners calculated as the sum of country k's equity owned by other countries. The share of domestic equity in portfolio (μ) is 1 minus the share of foreign equity in portfolio calculated as a ratio of total foreign equity held by country over the country's total equity portfolio

$$\mu^k = 1 - \frac{\text{foreign equity held by } k}{k\text{´s total equity in portfolio}},$$

$$= 1 - \frac{\text{foreign equity held by } k}{SMC^k + \text{foreign equity held by } k - k\text{´s equity held by foreigners}},$$

$$= 1 - \frac{\text{foreign equity held by } k}{SMC^k + k\text{'s assets} - k\text{´s liabilities}}.$$

As an indicator for trade openness I apply two different measures: the first measure is trade shares in GDP (the sum of imports and exports over GDP), that is a traditional and widely used concept in the empirical literature. The crucial shortcoming of this measure is based on the fact that it is an outcome based measure that entails potential biased results. That is why I use as an alternative a rule-based measure of trade openness, which is Trade Freedom Index provided by the Heritage Foundation. Both measures are denominated as TO_o and TO_r respectively. TO_o is "openness in constant prices" from Penn World Tables 6.3 and ranges from 1982 to 2007. TO_r is only available for the period 1995-2008. Trade Freedom Index is a composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. Trade Freedom (as well as Financial Freedom) is graded using a scale from 0 to 100, where 100 represents the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom.

The measurement of the extent of financial openness is a difficult and challenging enterprise. There is a number of studies that have tried to capture the complexity of real world capital controls with varying degrees of success.[42] While it is ambitious to say anything decisive about the actual degree of financial openness for most countries, these indicators do share some common features. First, all of them show a decreasing trend in financial restrictions over the years, consistent with the belief of increased globalization seen in the surge of cross-border financial flows. They also suggest that more developed countries have been more financially open, consistent with the belief that industrial countries interact more with the rest of the world.

Here, I focus on two alternative measures FO_1 and FO_2 for financial openness. FO_2 is Heritage Foundation's Financial Freedom Index, available from 1995 to 2008. Financial freedom is a measure of banking security as well as a measure of independence from government control. Heritage Foundation scores Financial Freedom by determining the extent of government regulation of financial services; the extent of state intervention in banks and other financial services; the difficulty of opening and operating financial services firms (for both domestic and foreign individuals); and government influence on the allocation of credit.

FO_1 is Chinn and Ito's (2006) "KAOPEN" index of "capital openness". Chinn and Ito (2006) have standardized principal components of the major categories of AREAER (presence of multiple exchange rates, current account restrictions, capital account restrictions and requirement of the surrender of export proceeds). This index is available for 181 countries from 1970 to 2007. It takes on higher values the more open the country is to cross-border capital transactions. The series has a mean of zero by construction.[43]

[42] Widely available measure of capital restrictions is IMF Annual Report on Exchange Arrangements and Exchange Restrictons (AREAER). Though it is available for a large set of countries since 1966, this is a dummy indicator and does not provide any information about the intensity of the capital controls. Quinn (1997, 2003), Miniane (2004) and Brune et. al. (2001) have modified IMF's AREAER. But these indices either have limited coverage or are not publicly available. Bekaert, Harvey and Lundblad (2005) have constructed an index based on the data of equity market liberalization that is a 0/1 indicator. Chinn and Ito (2006) have created an index measuring the extensity of capital controls based on the IMF's AREAER. This index covers the largest available set of countries and years. Kaminsky and Schmukler (2003) have developed an index based on domestic financial sector liberalization, openness of the equity markets to foreign investment and capital account restrictions. It is provided for 28 countries and ranges from 1973 to 2005.

[43] Measures of *de facto* financial openness, like Lane–Milesi-Ferretti data, are deliber-

3.3.2 Real exchange rate hedging

I define the RER hedging term twofoldly. The first, more easily interpretable, definition is a correlation of RER changes and excess returns. This first measure is scale-invariant. The second one, acquired from GE models of Coeurdacier (2009) and van Wincoop and Warnock (2008), is given by a covariance-variance ratio: the covariance between the RER and the excess return on home relative to foreign equity, divided by the variance of the excess return. I denote this term as *beta* further on. Both terms are computed for every country k in my sample relative to the rest of the world. The rest of the world is composed of an equity-market-capitalization-weighted combination of countries in the sample except of country k. I conduct these computations for two samples of countries. While the first sample consists only of industrial countries for which the data are available from 1982,[44] the second one comprises industrial and emerging countries.[45] By adopting different country samples I pursue two objectives. First, comparing RER hedging terms for industrial countries in both samples I can appraise if including emerging countries' equities into the portfolio of industrial countries significantly affects the results. Second, I obtain the correlations and *betas* for an extended sample of emerging countries, that - to the best of my knowledge - has not been done before.

Table 3.1A gives the first insight how RER hedging terms for industrial countries look like. Almost all of the estimated coefficients are positive. Significant *beta*-coefficients vary between 0.05 for Hong Kong and 0.30 for the UK. [46] Only 5 countries out of 17 exhibit negative correlation coefficients,

ately not employed in this analysis in order to avoid any bias in results.

[44]Industrial countries in the first sample are AUT, BEL, CAN, DNK, FRA, GER, HKG, ITA, JPN, NLD, NOR, SGP, ESP, SWE, CHE, GBR, USA. FIN, GRC and PRT are not included in the first sample because the data for them are only available from 1988.

[45]Industrial countries are those mentioned in footnote 9 plus FIN, GRC and PRT. Emerging countries are ARG, BRA, CHL, COL, CZE, EGY, HUN, IND, IDN, ISR, JOR, KOR, MYS, MEX, MAR, PAK, PER, PHL, POL, RUS, ZAF, THA, TUR, VEN. However the data for COL, CZE, EGY, HUN, IND, ISR, MAR, PAK, PER, POL, RUS, ZAF and VEN are only available for 1995-2006.

[46]These results are consistent with VWW, who calculated the *beta*-coefficient only for

though they are barely different from zero. This result contradicts the suggestion made by Coeurdacier (2009) that this term should be negative in standard cases. Moreover, he argues that, due to his calibration, the RER hedging term could be positive but only for trade costs higher than 142%. Such high trade costs can only be generated by a very high risk aversion or by an elasticity of substitution between domestic and foreign goods that is lower than unity. Thus, given my estimations of the correlation of exchange rate changes and excess returns, we should either assume that prevailing risk aversion is high and/or elasticity of substitution is very low[47] or make attempt to modify the theoretical models in the way that they are consistent with the empirical evidence.

The first row of Table 3.1A reveals another striking feature of the estimated RER hedging terms: only non-EMU countries have statistically highly significant correlation coefficients while for EMU countries these coefficients are not significant. This result may be driven by the absence of nominal exchange rate volatility across the EMU.

From Table 3.1B we obtain a flavor how the correlation of interest evolves over time in five years intervals. For the period 1982-2002 I obtain very similar results: almost all EMU countries have insignificant RER hedging terms with few exceptions like Spain (1982-1987, 1993-1997), Italy (1982-1987, 1993-1997) and France (1982-1987). However, in the period 2002-2007 nearly all countries in this sample have positive and highly significant correlations of RER changes and excess returns. It is noteworthy that in the period 1997-2002 the variance of excess returns is significantly higher for the majority of countries. This result is probably driven by the crisis that hit industrial countries at the beginning of the 2000s.

The data for emerging countries is not complete. For some countries data is available from 1988, for other it starts only with 1995. According to the data availability, there are two samples of countries expanded with emerging

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the US. Their coefficient is somewhat higher (0.3172) than mine (0.242). The difference in time periods and countries sample(VWW 1988-2005, my 1982-2007) may be the reasons for the discrepancy.

[47] Heathcote and Perri (2002) argue that this elasticity is slightly lower than one in short-run estimates for the United States relative to the rest of the world.

market countries. First, I add only countries for which the data is available from 1988. I refer to this sample as "short" sample because it consists of 20 industrial and 11 emerging countries. This sample ranges from 1988 to 2007. The second sample is referred to as "full" sample and consists of 20 industrial and 24 emerging countries for the period 1995-2006. From Tables 3.2 A-C it is apparent that including emerging countries into the sample does not change the results for industrial countries. It is still true irrespective of countries and/or period sample that EMU countries feature insignificant correlation coefficients of RER changes and excess returns. Notably, in the short sample I obtain positive and highly significant results suggesting that emerging countries do care about RER hedging. However, there are some countries in the full sample which exhibit insignificant correlation coefficient. The reason for this result might be due to the nature of shocks that these countries have experienced or due to the quality of available data on equity returns. Quinquennial analysis of the correlations for emerging countries reveals that in the first five-years period only few countries-with only 10% p-value-have statistically significant correlations. Emerging countries have experienced the highest RER hedging term between 1998 and 2002.

In addition, since I use monthly data I also compute RER hedging terms for every year, which will allow further panel data application. The annual computed coefficients are not reported. Instead, I present the summary of descriptive statistics of the results in Table 3.3. It is obvious that the coefficients of all but two countries could take both negative and positive values. The largest negative values of the correlation lie between -0.8 and -0.7 for HKG, POL, EGY, HUN, RUS and USA and the largest positive - around 0.9 for BRA, PHL, IND, SGP, TUR and COL. The results also reveal that within 12 years between 1995 and 2006 there is no country that has correlation coefficients that were continuously significant at least at the 10% level. Countries whose correlation coefficient has never been statistically significant are Germany and Finland. The volatility of the computed correlations is a little bit higher for emerging markets.[48] All in all, we see a lot of variability in correlations between exchange rate changes and excess returns both across

[48] Two exceptions among industrial countries are the United States and Hong Kong.

countries and across time.

3.3.3 Home bias and real exchange rate hedging

Given my estimated RER hedging terms, I ask the question whether they can explain observed domestic equity holdings. In so doing, I run a regression of domestic equity holdings on the computed RER hedging terms. Since I have two different measures of RER hedging term - $\rho(\Delta q, er)$ and $beta$ - I apply both of them in separate regressions. In addition, I also run a regression where I include both $\rho(\Delta q, er)$ and σ_{er}, which are the two components of my second RER hedging term. This allows me to distinguish between these two terms that may differently affect domestic equity holdings. Whereas the first one measures the tendency of exchange rate changes and excess returns to vary in the same direction and is supposed to have a positive impact on domestic equity holdings, the second one captures the degree of risk associated with holding domestic equities which increases with the variances of both domestic and foreign equities and decreases with their covariance.

I conduct my analysis in two steps: first I employ cross-country estimations that will shed light on rather a long-run link between equity holdings and RER hedging. Second, I also use panel estimations that helps underline a short-run perspective of the relationship analyzed in this section.

Due to the data availability on equity holdings, I employ the RER hedging terms computed in the short sample mentioned above - consisting of 20 industrial countries and 10 emerging countries.

Cross-country estimations

Table 3.4A and 3.4B provide the results of cross-country regressions of an average of domestic equity holdings on the RER hedging term computed for a particular time period. To see the development of this relationship I also split the sample according to the country type and different sub-periods. While Table 3.4 contains the results for the whole time period 1988-2007 and two sub-periods 1988-1997 and 1998-2007, Table 3.5 displays the results for the 5-years-averages – 1988-1992, 1993-1997, 1997-2002, 2003-2007. The regressions run for each particular specification is parametrized as follows

$$\bar{\mu}^k = \alpha_0 + \alpha_1 \rho^k + \epsilon^k \ ,$$

$$\bar{\mu}^k = \alpha_0 + \alpha_1 \beta^k + \epsilon^k \ ,$$

or

$$\bar{\mu}^k = \alpha_0 + \alpha_1 \rho^k + \alpha_2 \sigma_{er}^k + \epsilon^k \ ,$$

where ρ^k is a correlation of exchange rate changes and excess returns, β^k is a covariance-variance ratio, i.e. $\frac{cov(\Delta q, er)}{var(er)}$, σ_{er}^k is a variance of excess returns, $\bar{\mu}^k$ is a demeaned average of country k domestic equity holdings over a specified time range, defined as

$$\bar{\mu}^k = \frac{1}{T} \sum_{t=1}^{T} \mu_t^k - \frac{1}{K} \frac{1}{T} \sum_{k=1}^{K} \sum_{t=1}^{T} \mu_t^k \ ,$$

with K and T number of countries and years in a sample respectively.

Panel A of Table 3.4A reveals that for all countries in the sample the correlation of relative inflation and excess return seems to be a good determinant of domestic equity holdings: higher correlation, i.e. high inflation in country i implies high excess returns in this country, leads to higher domestic equity holdings in the long perspective. This result is in line with Adler and Dumas (1983), Cooper and Kaplanis (1994) and Obstfeld and Rogoff (2007) who suggested that RER hedging motive might be one of the potential explanations for home equity bias. Moreover, the higher volatility of excess returns turns out to lead to higher domestic equity holdings, that is a rather unexpected result. However, splitting the sample into sub-periods reveals that in the period 1988-1997 only the riskiness of domestic returns, σ_{er}, plays a significant role in the determination of domestic equity portfolio suggesting that the results for the whole period are mainly driven by the second sub-period.

Panels B and C reveal that the dependence of domestic equity holdings on the volatility of returns is more pronounced in industrial countries, whereas for emerging countries the RER hedging motive plays a much more important role in domestic holdings determination than the risk of holding domestic equity.

The results presented in Table 3.4A are illustrated in Figure 3, which displays the corresponding scatter plots.

Panel estimations

In this section I exploit the panel dimension of the data. The goal is to better understand the short-run determinants by studying higher-frequency shifts in domestic equity holdings. By controlling for country- and time-fixed effects, I remove unobservable country and time characteristics to see which of the determinants affect within-country shifts in μ.[49]

Table 3.5 provides the results. The panel dimension provides some new insights. The most striking finding is that, the correlation term now exhibits a negative coefficient. Holding fixed other factors, the value of μ decreases for those countries that have experienced an increase in the correlation between excess returns and exchange rate changes. Thus, in a short-run, investors do not tend to care about RER hedging. It is also apparent, that for industrial countries, and in particular for industrial non-EMU countries, this effect is the strongest and highly significant. However, for emerging countries, positive ρ increases domestic equity holdings, even in the short-run. Though, this result is borderline insignificant.

In contrast to cross-sectional analysis, we see here that higher volatility of domestic excess returns is clearly associated with less domestic equity in portfolio. This is very intuitive result: short-run portfolio movements are in fact mainly driven by the volatility of equity returns, i.e. equity's exposure to risk. And again, this effect is more pronounced among industrial non-EMU countries.

In addition, splitting the sample in two sub-periods reveals that, in the all countries sample, the results with respect to ρ are rather driven by the

[49] To control for country- and time-fixed effects I remove cross-country and time means.

second sub-period and with respect to σ_{er} in the first sub-period, where these terms exhibits much more significant coefficients.

3.3.4 Introducing trade openness and financial openness

Cross-country estimations

According to the theory, trade openness should negatively affect domestic equity holdings: falling trade barriers, i.e. progressing trade openness, is supposed to reduce domestic equity holdings, because low trade barriers imply higher competition for domestic firms which in turn increases volatility of domestic equities returns. Thus, due to the risk aversion of domestic investors, they would incline to hold more foreign and less home equities.

Table 3.6 provides the results after introducing trade openness into the regression run above. The coefficient of both trade openness measures are signed as expected: the more open is a country for trade, the less are holdings in domestic equity. It is apparent that only rule based measure of trade openness significantly affects the domestic equity holdings when used as the only determinant. It is true for both measures of trade openness, though the coefficient of the rule-based measure is much more statistically significant. Adding the RER hedging term in form of correlation of RER changes and excess returns into the regression does not change the effect of outcome-based trade openness a lot, but it reduces the effect of rule-based measure of trade openness. The effect of RER hedging terms remains significant throughout all specifications.

The theoretical mechanism of the effect of trade openness on domestic equity holdings works through volatility of cash-flows: since more open countries are less sheltered from competition, they have more volatile cash-flows, and thus their equity returns are also more volatile. This intuition is supported by the next results where I also include the variance of excess returns into the regression: the impact of trade openness on domestic equity holdings becomes considerably reduced while variance of excess returns still significantly bears on domestic equity in portfolio.

It is beyond dispute that financial openness negatively affects domestic equity holdings. Opening financial markets incites domestic investors to invest abroad due to the enhanced investment possibilities and in search for higher and less risky returns that induces more diversified portfolios.

I have repeated similar regressions for the financial openness measures, FO_1 and FO_2. Table 3.7 reproduces all specifications from Table 3.6 but with FO_1 and FO_2 as the independent variable. The results reveal that both measures of financial openness indeed imply lower holdings of domestic equities in portfolio in a cross-section analysis over the whole period between 1988 and 2007. Again, the inclusion of the measure of financial openness does not change my results with respect to variation of domestic equity holdings as a function of correlation of excess returns and exchange rate changes, though. Moreover, adding volatility of excess returns into regression does not affect significantly the explanatory power of financial openness.

Panel estimations

This section considers the impact of trade and financial openness on domestic equity holdings in the panel estimation scope. To this end, it has to be mentioned that the extent of time variation in the openness measures is very limited. This problem especially affects the Economic Freedom Data provided by Heritage Foundation. Thus, while interpreting the results in this section we should take into account this drawback of the openness data.

Table 3.8A confirms that also in a shorter-run trade openness negatively affects domestic equity holdings: countries that are more open to trade hold less domestic equities. The results for outcome-based measure are more significant in panel estimation procedure than in cross-section. In contrast to cross-section, outcome-based measure of trade openness remains still highly significant after introducing the variance of excess returns into regression. However, the RER hedging term is not significant in all specifications. This result may just reflect the fact, that in the panel estimations $\rho(er, \Delta q)$ and β have never been significant in the full sample of countries.

As presumed before, the rule-based measure of trade openness is likely to be a bad determinant of domestic equity holdings in a shorter-run. Table 3.8A also displays the results of the panel regression estimates without country fixed-effect. The regressions with country fixed effects are more interpretable as reflecting year-by-year holding of home equities while the results from regressions without country fixed effects are partly supposed to reflect long-run portfolio holdings. Based on the results above, the interpretation is that trade openness plays a much more important role as a determinant of portfolio allocation in a longer run than in the short run.

Table 3.8B demonstrates the difference of the impact of trade openness on industrial and emerging countries. It is obvious that for industrial countries being more open to trade is much more important than for emerging countries. The effect of trade openness on equity holdings is borderline significant at the conventional 5 percent level and of the same order of magnitude as it was in the cross-section analysis. RER hedging and variance of excess returns remain good predictors for domestic equity holdings only in a specification with an outcome-based measure of trade openness. However, the most striking result concerns emerging countries. There is not any good determinant of equity holdings in emerging countries in the short-run perspective.

To explore further the effect of trade openness on domestic equity holdings, I add an interaction term of trade openness with RER hedging into the panel regressions. The results of these estimations are summarized in Tables 3.9A, 3.9B and 3.9C. The impact of trade openness on domestic equity holdings is amplified in countries where RER changes and excess returns are positively correlated. Moreover, it is apparent from Table 3.9A that in more open economies the effect of variance of excess return on the share of domestic equity in portfolio is dampened. Tables 3.9B and 3.9C show that regardless the country group the effect of RER hedging on equity holdings is more pronounced in economies that are more open to trade. For industrial countries both coefficients on ρ and $\rho * TO$ are positive. After becoming more open, industrial countries, and in particular non-EMU countries, start to take into account fluctuations in the real exchange rate when determining their portfolio holdings. These results may suggest that there are less risk sharing possibilities through terms of trade when countries become more open, so that they are forced to invest into foreign equity in order to achieve a certain degree of risk sharing.

Tables 3.10A, 3.10B and 3.10C consider the impact of financial openness on holdings of domestic equity in portfolio. In the sample with all countries, Table 3.10A, the estimated impact of FO_1 on domestic equity holdings is negative and significant in all specifications. For FO_2, I find a significant effect on equity holdings only when country fixed effects are not included. In the specification with σ_{er}, we see some remarkable outcomes: the coefficient on σ_{er} is negative and significant in the regression with FO_1 and country fixed effects, but surprisingly high and positive when country fixed effects are not controlled for and FO_2 is included.

In addition, it is noteworthy to examine if there are any differences in the impact of financial openness on domestic equity holdings in emerging and industrial countries. Table 3.10B uncovers that only in emerging countries financial openness coherently and significantly determines domestic equity holdings: the more open the country, the less domestic equity it holds. In the industrial countries sample the results are rather odd: the coefficient on FO_2 is barely different from zero and the coefficient on FO_1 is insignificant but it is positively signed. Trying to explain this results, I split the sample of industrial countries into two groups - see Table 3.10C - depending on the membership in the EMU. Financial openness in these two groups affects domestic equity holdings in two opposite directions: while in non-EMU countries the effect is consistent with our reasoning, EMU countries exhibit a positive and highly significant coefficient on FO_1 which probably drives the results for the whole sample of industrial countries. This is an interesting and somewhat peculiar result. However, I do not attempt to more systematically trace this question and give any interpretation to it.

Overall, the results for the impact of financial openness in the panel estimations are roughly similar to those found in the cross-section. There seems to be some tendency for financial openness to have quite different effects within the EMU in comparison to other countries. Moreover, financial openness is likely to be the only determinant of domestic equity holdings for emerging countries in the shorter-run perspective.

3.3.5 Home bias and labour income

There is a large literature focusing on the role of uninsurable idiosyncratic risks for the portfolio composition.[50] It emphasizes that in the presence of background risks—from labour income, proprietary income or real estate—individuals hold assets that provide them insurance. Building on this literature, several recent papers have argued that a large degree of observed home bias is generated by non-tradeable income risk. Since labour income seems to be *"the most obvious source of background risk that is large and difficult to insure or diversify"*,[51] it affects the portfolio decision of workers/investors because they seek to hedge it, and thus tend to hold assets that provide high returns, when domestic non-tradeable assets (labour income) yield low returns. Therefore, home bias or portfolio holdings depend on the correlation between returns on domestic assets and payoffs on domestic non-tradeable assets. And again, the sign of this correlation is crucial here: whereas domestic labour earnings that are negatively correlated with domestic returns offer a good hedge against labour income risk and imply *home* bias, positive correlation results in *foreign* bias.[52]

These theoretical predictions have been repeatedly analyzed by diverse studies both at the international and intranational levels. Bottazzi et al. (1996) document negative correlation between wage and profit rates in most OECD countries. Abowd (1989) finds a negative correlation using bargaining unit wage data and NYSE stock returns. Davis and Willen (2000) estimate the correlation between financial asset returns and labour income shocks

[50] see e.g. Heaton and Lucas (2000), Bottazzi, Pesenti and van Wincoop (1996), Palacios-Huerta (2001), Julliard (2003 and 2004), Engel and Matsumoto (2006), Coeurdacier, Martin and Kollmann (2010).

[51] Heaton and Lucas (2000), p.5.

[52] However, there also exists another line of reasoning that assert exactly converse intuition: if labour income is more correlated with domestic equity returns than with the foreign ones, then foreign equities provide better insurance against labour income risk and negative correlation of domestic returns and domestic wages entails foreign bias. Cole (1988), Brainard and Tobin (1992), Baxter and Jermann (1997) suggest this mechanism. This financial risk hedging motive becomes more important than the income risk hedging motive only when the ratio of liquid wealth to labour income is sufficiently high. But, this rationale has not found any strong support from the empirical studies on labour income and asset returns. That is why I do not track this intuition.

for various sex-education groups. This correlation ranges from -0.25 for the least educated men to 0.25 for college-educated women. For men with less than a college education and certain educational groups of women, labor income shocks covary negatively with own-industry equity returns. Moreover, Gali (1999), Rotemberg (2003) and Francis and Ramsey (2004) also find a negative correlation between labour hours and productivity.

To explore this additional source of home bias emanating from the labour income risk hedging motive, I estimate correlation coefficients between relative wages and excess returns $(\rho(\omega, \sigma_{er})$. I refer to this correlation as labour income hedging term. The computational procedure is similar to that on inflation hedging term. The relative wage in country k, ω_k is calculated as the difference between the wage in country k and the rest of the world (RoW) wage $\omega_k = w_k^{NC_k} - w_{RoW,k}^{NC_k}$,where $w_k^{NC_k}$ is the horly compensation costs of production worker in country k expressed in currency of country k.

Using data for 16 industrial countries from 1982 to 2006,[53] I found that for ten countries this correlation is negative. However, there is no coefficient significant at least at the 10% level.[54] However, it should be mentioned at this point that the data on wages by its nature is much less volatile than the data on equity returns and even the data on prices. Thus, measuring correlation of wages with returns captures long run co-movements.

That is why it is only reasonable to examine the role of labour income hedge on home bias in the cross-sectional analysis. In so doing, I estimate a cross-section OLS regression

[53] The same data sample as it was used for the estimation of inflation hedging across industrial countries except of Germany. Data on wages for Germany is only available from 1993. The data on wages is comparative hourly compensation costs in national currencies for production workers in manufacturing and is from the International Labor Comparisons.

[54] For the period 1982-2006 the correlation coefficients are -0.01 (AUT) , -0.02 (BEL), -0.00 (CAN), -0.10 (DNK), 0.26 (FRA), -0.03 (HKG), -0.16 (ITA), -0.16 (JPN), -0.06 (NLD), 0.08 (NOR), -0.07 (SGP), 0.00 (ESP), 0.18 (SWE), 0.08 (CHE), 0.19 (GBR), -0.23 (USA). The correlation coefficients are estimated relative to the RoW. The correlations computed for the period 1988-2006 and employed in the cross-section analysis are -0.00 (AUT) , 0.27 (BEL), 0.11 (CAN), 0.13 (DNK), -0.39 (FIN), 0.23 (FRA), 0.25 (GRC), -0.24 (HKG), -0.10 (ITA), 0.19 (JPN), 0.36 (NLD), 0.29 (NOR), 0.41 (PRT), -0.47 (SGP), 0.22 (ESP), 0.20 (SWE), 0.29 (CHE), 0.19 (GBR), 0.07 (USA). The amendment of the country sample is made in order to obtain comparable results in the cross-section.

$$\bar{\mu}^k = \alpha_0 + \alpha_1 \rho^k(\omega, \sigma_{er}) + \epsilon^k \ .$$

For the period 1988-2006, I found that $\alpha_1$is -0.04 but not statistically significant[55]. This result is consistent with the theory predictions: countries, where labour income negatively co-varies with equity returns, hold more domestic equities, because they potentially provide better hedge aginst labour income risk.

3.4 Concluding remarks

In this section I compute two alternative RER hedging terms proposed by the theoretical literature for an extended sample of countries. Correlation coefficients of exchange rate changes and excess returns seem to be positive and highly significant for the majority of countries in the sample. The only exception are EMU-countries that exhibit correlation coefficients that are not significantly different from nil.

Moreover, estimated RER hedging terms have proven to be a good determinant of domestic equity holdings. This result corroborates Obstfeld and Rogoff's (2006) suggestion, though it is at odds with Cooper and Kaplanis (1994) and van Wincoop and Warnock (2008) outcomes. Thus, the results point out that the RER hedging motive does matter for investors while building their portfolios.

On the one hand, a higher correlation of RER changes with excess returns implies higher holdings of domestic equity in the long run. Whereas RER hedging is especially important for emerging countries, for industrial countries volatility of returns does matter for equity holdings determination. On the other hand, in the short run RER hedging motive lowers domestic equity holdings, and this effect plays a significant role solely in industrial non-EMU countries.

In addition, I have also examined whether trade openness and financial

[55] I obtained the results of the same magnitude for the period 1982-2006 and also using correlation coefficients estimated by Bottazzi et al. (1996).

openness help explain home equity bias. As expected, trade openness decreases holdings of domestic equities in portfolio. Moreover, trade openness amplifies the incentive to hedge against RER fluctuations. Though financial openness lowers domestic equity holdings, it does not affect the impact of RER hedging on portfolio determination.

This chapter focuses on macro-level covariations and their role in the portfolio determination. I believe that this contributes to many theoretical papers that aim at identifying the underlying structural determinants of home bias.

Appendix

Table 3.1A: Real Exchange Rate Hedging Term: Industrial Countries, 1982-2007

Country	$\rho(\Delta q, er)$	β	σ_{er}
AUT	-0.061	-0.141	0.0210
BEL	-0.045	-0.202	0.0425
CAN	0.263***	0.189***	0.0007
DNK	0.166***	0.118***	0.0010
FRA	0.070	0.192	0.0114
GER	0.066	0.062	0.0021
HKG	0.158***	0.048***	0.0006
ITA	-0.060	-0.453	0.1813
JPN	0.489***	0.247***	0.0010
NLD	-0.028	-0.039	0.0026
NOR	0.136**	0.076**	0.0010
SGP	0.241***	0.094***	0.0006
ESP	-0.015	-0.067	0.0822
SWE	0.087	0.053	0.0011
CHE	0.248***	0.224***	0.0012
GBR	0.296***	0.304***	0.0013
USA	0.244***	0.242***	0.0017

$corr(\Delta q, er)$ denotes a correlation of real exchange rate changes and excess returns. β is a *beta*-coefficient of the time-series OLS regression of real exchange rate changes on excess returns, that formally equals to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} is a variance of excess returns. All terms are computed for every country k in the sample relative to the rest of the world. The rest of the world is composed of an equity-market-capitalization-weighted combination of countries in the sample except of country k.

Table 3.1B: Real Exchange Rate Hedging Term: Industrial Countries, 1982-2007 quinquennial

	82-87			87-92			93-97		
Country	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}
AUT	0.080	0.043	0.0017	-0.116	-0.050	0.0014	0.106	0.104	0.0009
BEL	0.109	0.113	0.0018	0.205	0.163	0.0013	0.192	0.215	0.0009
CAN	0.156	0.075	0.0007	0.281**	0.242**	0.0013	0.243*	0.203**	0.0005
DNK	0.220*	0.128	0.0016	0.079	0.051	0.0013	0.163	0.120	0.0010
FRA	0.398***	0.331***	0.0017	0.046	0.022	0.0013	0.037	0.048	0.0010
GER	0.097	0.060	0.0017	0.060	0.037	0.0014	0.088	0.070	0.0010
HKG	0.384***	0.099***	0.0009	-0.033	-0.009	0.0009	0.056	0.015	0.0004
ITA	0.229*	0.121**	0.0014	0.087	0.065	0.0013	0.268**	0.126**	0.0010
JPN	0.569***	0.277***	0.0010	0.552***	0.189***	0.0006	0.516***	0.261***	0.0010
NLD	0.095	0.117	0.0022	0.181	0.189	0.0015	0.237*	0.258	0.0010
NOR	0.141	0.070	0.0015	-0.126	-0.066	0.0012	0.314**	0.210**	0.0009
SGP	0.161	0.045	0.0007	-0.090	-0.062	0.0007	0.204	0.102*	0.0005
ESP	0.401***	0.225***	0.0015	0.069	0.060	0.0013	0.480***	0.352***	0.0013
SWE	-0.003	0.000	0.0015	-0.217*	-0.169*	0.0014	0.392***	0.289***	0.0014
CHE	0.080	0.060	0.0017	0.221*	0.191	0.0013	0.397***	0.361***	0.0013
GBR	0.330***	0.289***	0.0019	0.204	0.223	0.0021	0.287**	0.352***	0.0013
USA	0.375***	0.286***	0.0018	0.420***	0.398***	0.0029	-0.158	-0.139	0.0008

see notes to table 3.1A.

Table 3.1B: continued

	97-02			02-07		
Country	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}
AUT	-0.1513	-0.809	0.1038	0.1183	0.084	0.0003
BEL	-0.1101	-0.971	0.2146	0.3352***	0.195***	0.0002
CAN	0.1741	0.087	0.0004	0.6587***	0.544***	0.0005
DNK	0.2894**	0.188**	0.0008	0.1564	0.109	0.0003
FRA	0.0450	0.362	0.0544	0.3305***	0.310***	0.0003
GER	0.0531	0.067	0.0059	0.2305*	0.145**	0.0003
HKG	-0.0454	-0.009	0.0003	-0.0250	-0.026	0.0002
ITA	-0.1922	-3.432	0.9298	0.4906***	0.303***	0.0003
JPN	0.3709***	0.278***	0.0017	0.4646***	0.229***	0.0004
NLD	-0.2382*	-0.562*	0.0081	0.1579	0.122	0.0003
NOR	0.2864**	0.133**	0.0006	0.3717***	0.203***	0.0007
SGP	0.5533***	0.174***	0.0007	0.4107***	0.169***	0.0002
ESP	-0.1096	-1.478	0.4187	0.2624**	0.206**	0.0003
SWE	0.1443	0.055	0.0005	0.4465***	0.324***	0.0006
CHE	0.4727***	0.326***	0.0009	0.3240***	0.317**	0.0004
GBR	0.4176***	0.418***	0.0007	0.4551***	0.463***	0.0003
USA	-0.0016	-0.007	0.0021	0.4193***	0.651***	0.0008

see notes to table 3.1A.

Table 3.2A: Real Exchange Rate Hedging Term: All Countries

	1988-2007			1995-2006		
Country	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}
AUT	-0.077	-0.214	0.0035	-0.105	-0.449	0.0023
BEL	-0.054	-0.323	0.0015	-0.080	-0.568	0.0016
CAN	0.306***	0.237***	0.0012	0.293***	0.208***	0.0010
DNK	0.175***	0.126***	0.0016	0.188**	0.134**	0.0013
FIN	0.066	0.098	0.0057	0.078	0.141	0.0067
FRA	0.039	0.127	0.0014	0.066	0.354	0.0009
GER	0.067	0.071	0.0020	0.078	0.108	0.0015
GRC	-0.059	-0.250	0.0079	-0.085	-0.546	0.0052
HKG	0.003	0.001	0.0038	0.014	0.006	0.0037
ITA	-0.078	-0.718	0.0028	-0.131	-1.715	0.0022
JPN	0.457***	0.244***	0.0033	0.436***	0.299***	0.0026
NLD	-0.060	-0.104	0.0009	-0.144*	-0.292*	0.0010
NOR	0.154**	0.086**	0.0027	0.328***	0.187***	0.0022
PRT	0.047	0.293	0.0029	0.045	0.413	0.0024
SGP	0.306***	0.133***	0.0029	0.501***	0.198***	0.0036
ESP	-0.039	-0.306	0.0017	-0.078	-0.706	0.0015
SWE	0.137**	0.089**	0.0024	0.235***	0.129***	0.0024
CHE	0.359***	0.312***	0.0013	0.4566***	0.381***	0.0013
GBR	0.303***	0.340***	0.0009	0.408***	0.479***	0.0006
USA	0.190***	0.209***	0.0013	-0.026	-0.041	0.0008
ARG	0.086	0.086	0.0208	0.348***	0.185***	0.0107
BRA	0.184***	0.0816***	0.0224	0.616***	0.446***	0.0091
CHL	0.233***	0.099***	0.0042	0.312***	0.168***	0.0028
COL				0.222***	0.080***	0.0093
CZE				0.366***	0.155***	0.0060
EGY				-0.032	-0.014	0.0077
HUN				0.206***	0.060**	0.0076
IND				0.071	0.023	0.0060
IDN	0.4863***	0.2880***	0.0182	0.629***	0.466***	0.0187
ISR				0.243***	0.094***	0.0036
JOR	0.1192**	0.0472**	0.0039	0.064	0.021	0.0039
KOR	0.5163***	0.2174***	0.0092	0.599***	0.265***	0.0115
MYS	0.3459***	0.1328***	0.0063	0.467***	0.183***	0.0080
MEX	0.4736***	0.2687***	0.0067	0.466***	0.257***	0.0049
MAR				0.139*	0.050	0.0039
PAK				0.085	0.021	0.0136
PER				0.160*	0.047*	0.0058
PHL	0.3730***	0.1422***	0.0073	0.549***	0.209***	0.0074
POL				0.347***	0.118***	0.0080
RUS				-0.020	-0.015	0.0043
ZAF				0.051	0.024	0.0103
THA	0.2454***	0.0856***	0.0104	0.296***	0.114***	0.0127
TUR	0.3258***	0.0972***	0.0253	0.406***	0.135***	0.0216
VEN				0.017	0.010	0.0173

see notes to table 3.1A.

Table 3.2B: Real Exchange Rate Hedging Term: All Countries, decennial

	1988-1997			1998-2007		
Country	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}
AUT	-0.038	-0.016	0.0046	0.138	-0.597	0.0023
BEL	0.218**	0.200**	0.0013	-0.090	-0.657	0.0018
CAN	0.256***	0.226***	0.0012	0.364***	0.243***	0.0011
DNK	0.131	0.092	0.0020	0.262***	0.160***	0.0013
FIN	0.022	0.016	0.0045	0.075	0.155	0.0069
FRA	0.050	0.036	0.0020	0.057	0.385	0.0008
GER	0.084	0.058	0.0024	0.062	0.092	0.0015
GRC	-0.106	-0.037	0.0103	-0.093	-0.624	0.0055
HKG	0.023	0.011	0.0043	-0.045	-0.015	0.0033
ITA	0.175*	0.101**	0.0039	0.163*	-2.633*	0.0017
JPN	0.535***	0.235***	0.0043	0.388***	0.261***	0.0023
NLD	0.229**	0.251**	0.0008	-0.185**	-0.381**	0.0010
NOR	0.040	0.023	0.0030	0.322***	0.164***	0.0023
PRT	0.209**	0.124**	0.0033	0.050	0.475	0.0025
SGP	0.084	0.049	0.0020	0.535***	0.178***	0.0038
ESP	0.290***	0.235***	0.0020	-0.098	-1.061	0.0013
SWE	0.089	0.062	0.0023	0.227**	0.104**	0.0025
CHE	0.323***	0.292***	0.0014	0.443***	0.323***	0.0011
GBR	0.261***	0.305***	0.0012	0.429***	0.416***	0.0006
USA	0.248***	0.218**	0.0019	0.089	0.159	0.0006
ARG	0.032	0.038	0.0299	0.379***	0.211***	0.0116
BRA	-0.140	-0.040	0.0351	0.686***	0.529***	0.0096
CHL	0.178*	0.066*	0.0055	0.316***	0.160***	0.0028
IDN	0.293***	0.080***	0.0184	0.630***	0.502***	0.0180
JOR	0.179**	0.110**	0.0032	0.031	0.006	0.0046
KOR	0.518***	0.263***	0.0082	0.510***	0.178***	0.0098
MYS	0.254***	0.111***	0.0053	0.417***	0.150***	0.0074
MEX	0.490***	0.287***	0.0099	0.422***	0.203***	0.0036
PHL	0.227**	0.094**	0.0078	0.580***	0.199***	0.0068
THA	0.183**	0.072**	0.0094	0.293***	0.098***	0.0115
TUR	0.155*	0.039*	0.0288	0.501***	0.176***	0.0218

see notes to table 3.1A.

Table 3.2C: Real Exchange Rate Hedging Term: All Countries, quinquennial

	1988-1992			1993-1997		
Country	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}
AUT	-0.112	-0.047	0.0077	0.132	0.132	0.0015
BEL	0.228*	0.180*	0.0018	0.210	0.248	0.0007
CAN	0.285**	0.245**	0.0017	0.197	0.185	0.0008
DNK	0.097	0.063	0.0024	0.179	0.140	0.0015
FIN	-0.314**	-0.143**	0.0043	0.350***	0.179**	0.0043
FRA	0.051	0.026	0.0028	0.045	0.060	0.0012
GER	0.070	0.043	0.0034	0.111	0.094	0.0014
GRC	-0.075	-0.021	0.0175	-0.207	-0.120	0.0033
HKG	-0.021	-0.002	0.0034	0.064	0.019	0.0052
ITA	0.098	0.070	0.0034	0.253*	0.125**	0.0044
JPN	0.551***	0.191***	0.0049	0.544***	0.291***	0.0038
NLD	0.205	0.215	0.0010	0.270**	0.317*	0.0005
NOR	-0.113	-0.058	0.0043	0.308**	0.218**	0.0018
PRT	0.297**	0.136**	0.0041	0.163	0.103	0.0024
SGP	-0.070	-0.047	0.0015	0.189	0.107*	0.0025
ESP	0.094	0.078	0.0019	0.487***	0.377***	0.0021
SWE	-0.195	-0.150	0.0024	0.386***	0.298***	0.0021
CHE	0.246*	0.211*	0.0016	0.404***	0.385***	0.0013
GBR	0.233*	0.253*	0.0016	0.311**	0.408**	0.0008
USA	0.413***	0.400***	0.0026	-0.203	-0.185*	0.0012
ARG	0.030	0.042	0.0543	-0.008	-0.002	0.0055
BRA	-0.218*	-0.062*	0.0612	0.314**	0.100**	0.0096
CHL	0.079	0.028	0.0070	0.332***	0.145***	0.0036
IDN	-0.002	-0.003	0.0242	0.590***	0.240***	0.0121
JOR	0.222*	0.139*	0.0041	0.108	0.060	0.0023
KOR	0.244*	0.093*	0.0070	0.654***	0.381***	0.0091
MYS	0.119	0.053	0.0027	0.312**	0.130***	0.0076
MEX	0.214*	0.111**	0.0087	0.643***	0.464***	0.0100
PHL	0.095	0.041	0.0069	0.323**	0.137***	0.0084
THA	0.073	0.019	0.0063	0.199	0.099**	0.0113
TUR	0.014	0.002	0.0345	0.290**	0.091**	0.0236

see notes to table 3.1A.

Table 3.2C: continued

	1998-2002			2003-2007		
Country	$\rho(\Delta q, er)$	β	σ_{er}	$\rho(\Delta q, er)$	β	σ_{er}
AUT	-0.146	-0.780	0.0037	0.121	0.086	0.0009
BEL	-0.102	-0.892	0.0029	0.338***	0.192***	0.0008
CAN	0.146	0.075	0.0015	0.652***	0.558***	0.0008
DNK	0.286**	0.184**	0.0018	0.147	0.104	0.0007
FIN	0.077	0.190	0.0110	0.036	0.013	0.0028
FRA	0.052	0.405	0.0012	0.343***	0.314***	0.0003
GER	0.057	0.072	0.0022	0.226*	0.143**	0.0008
GRC	-0.091	-0.735	0.0092	-0.119	-0.027	0.0016
HKG	-0.055	-0.012	0.0051	-0.041	-0.029	0.0014
ITA	-0.189	-3.399	0.0027	0.487***	0.289***	0.0007
JPN	0.370***	0.276***	0.0030	0.462***	0.234***	0.0017
NLD	-0.228*	-0.542*	0.0016	0.155	0.116	0.0005
NOR	0.280**	0.131**	0.0027	0.378***	0.210***	0.0018
PRT	0.063	0.572	0.0037	0.337***	0.166***	0.0012
SGP	0.559***	0.179***	0.0068	0.392***	0.170***	0.0007
ESP	-0.106	-1.454	0.0021	0.267**	0.213***	0.0006
SWE	0.126	0.050	0.0040	0.439***	0.322***	0.0010
CHE	0.476***	0.323***	0.0019	0.345***	0.327***	0.0004
GBR	0.415***	0.401***	0.0008	0.459***	0.453***	0.0003
USA	-0.015	-0.025	0.0009	0.390***	0.549***	0.0003
ARG	0.404***	0.262***	0.0167	0.167	0.063	0.0058
BRA	0.700***	0.581***	0.0143	0.574***	0.371***	0.0042
CHL	0.248*	0.126**	0.0040	0.383***	0.257***	0.0013
IDN	0.655***	0.550***	0.0312	0.441***	0.177***	0.0043
JOR	-0.099	-0.028	0.0041	0.181	0.035	0.0051
KOR	0.502***	0.174***	0.0169	0.556***	0.205***	0.0024
MYS	0.433***	0.154***	0.0133	0.286**	0.111**	0.0014
MEX	0.420***	0.190***	0.0057	0.468***	0.255***	0.0013
PHL	0.601***	0.211***	0.0099	0.474***	0.163***	0.0033
THA	0.295**	0.102**	0.0196	0.271**	0.074**	0.0033
TUR	0.424***	0.141***	0.0327	0.689***	0.289***	0.0102

see notes to table 3.1A.

Table 3.3: Descriptive Statistics Summary of annual estimated $\rho(\Delta q, er)$

country	min	max	std	# PV≤.1	country	min	max	std	# PV≤.1
		Industrial					Emerging		
AUT	-0.33	0.62	0.33	4	ARG	-0.37	0.71	0.32	1
BEL	-0.30	0.72	0.33	4	BRA	-0.57	0.92	0.43	7
CAN	-0.23	0.82	0.35	3	CHL	-0.19	0.69	0.29	3
DNK	-0.25	0.80	0.31	3	COL	-0.30	0.85	0.37	1
FIN	-0.25	0.46	0.25	0	CZE	-0.06	0.68	0.24	2
FRA	-0.44	0.60	0.30	5	EGY	-0.77	0.80	0.51	6
GER	-0.11	0.47	0.16	0	HUN	-0.75	0.79	0.50	7
GRC	-0.61	0.50	0.33	2	IND	-0.50	0.55	0.35	2
HKG	-0.82	0.53	0.42	3	IDN	-0.38	0.89	0.35	7
ITA	-0.43	0.67	0.37	4	ISR	-0.53	0.76	0.34	3
JPN	-0.37	0.84	0.33	5	JOR	-0.45	0.51	0.29	1
NLD	-0.66	0.76	0.39	4	KOR	-0.04	0.75	0.21	5
NOR	-0.21	0.66	0.28	5	MYS	-0.24	0.72	0.28	1
PRT	-0.11	0.70	0.30	4	MEX	0.04	0.69	0.19	7
SGP	-0.31	0.86	0.30	6	MAR	-0.20	0.58	0.25	1
ESP	-0.38	0.62	0.33	2	PAK	-0.33	0.58	0.31	1
SWE	-0.25	0.79	0.29	3	PER	-0.34	0.70	0.31	2
CHE	0.02	0.79	0.22	4	PHL	-0.15	0.91	0.31	7
GBR	0.15	0.81	0.25	5	POL	-0.80	0.76	0.44	8
USA	-0.73	0.66	0.49	3	RUS	-0.74	0.20	0.27	1
					ZAF	-0.53	0.45	0.26	1
					THA	-0.36	0.74	0.38	5
					TUR	-0.61	0.86	0.55	7
					VEN	-0.50	0.66	0.38	2

The table reports descriptive statistics of annual correlation of exchange rate changes and excess returns computed from the monthly data for the period 1995-2006.

Table 3.4A: Domestic Equity Holdings and Real Exchange Rate Hedging, Cross-Section

κ^k	88-07			88-97			98-07		
				Panel A: All countries					
β		0.14			-0.31			0.07	
		(1.28)			(-1.76)			(1.25)	
$\rho(er, \Delta q)$	0.35		0.25	0.05		0.12	0.33		0.14
	(2.79)		(2.19)	(0.37)		(1.04)	(2.72)		(1.14)
σ_{er}			9.83			5.24			17.70
			(3.12)			(2.46)			(2.86)
R^2	0.22	0.06	0.43	0.01	0.10	0.19	0.21	0.05	0.39
				Panel B: Industrial countries					
	88-07			88-97			98-07		
β		0.03			-0.35			0.00	
		(0.29)			(-1.87)			(0.06)	
$\rho(er, \Delta q)$	0.06		0.16	-0.10		0.11	-0.04		-0.02
	(0.32)		(1.00)	(-0.60)		(0.72)	(-0.22)		(-0.15)
σ_{er}			36.45			30.16			14.80
			(2.41)			(2.72)			(0.64)
R^2	0.01	0.01	0.26	0.02	0.16	0.32	0.00	0.00	0.03
				Panel C: Emerging countries					
	88-07			88-97			98-07		
β		0.11			0.09			0.09	
		(0.51)			(0.50)			(0.64)	
$\rho(er, \Delta q)$	0.18		0.20	0.06		-0.03	0.22		0.17
	(1.70)		(1.60)	(0.71)		(-0.28)	(1.50)		(1.08)
σ_{er}			0.60			-2.37			3.44
			(0.27)			(-1.14)			(1.00)
R^2	0.27	0.03	0.27	0.06	0.03	0.21	0.22	0.05	0.32

The table reports the results of cross-country OLS regressions of the form $\bar{\mu}^k = \alpha_0 + \alpha_1 \kappa^k + \epsilon^k$ for different country samples and for the time period 1988-2007 and two sub-periods 1988-1997 and 1998-2007. μ^k denotes demeaned state-average of domestic equity holdings. κ^k contains state-specific RER hedging terms listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.4B: Domestic Equity Holdings and RER Hedging, Quinquennial, Cross-Section

						All countries						
κ^k		88-92			93-97			98-02			03-07	
β		-0.26			-0.17			0.06			0.07	
		(-1.90)			(-1.25)			(1.40)			(0.30)	
$\rho(er, \Delta q)$	-0.08		-0.05	0.12		0.01	0.27		0.09	0.30		0.17
	(-0.77)		(-0.46)	(1.18)		(0.13)	(2.29)		(0.72)	(1.59)		(0.94)
σ_{er}			1.02			14.52			10.77			45.27
			(0.76)			(3.89)			(2.72)			(2.79)
R^2	0.02	0.11	0.04	0.05	0.05	0.39	0.16	0.07	0.34	0.08	0.00	0.29
						Industrial countries						
		88-92			93-97			98-02			03-07	
β		-0.21			-0.25			0.01			0.13	
		(-1.43)			(-1.84)			(0.33)			(0.61)	
$\rho(er, \Delta q)$	-0.08		-0.034	-0.07		-0.09	-0.08		-0.07	-0.02		0.02
	(-0.69)		(-0.32)	(-0.57)		(-0.90)	(-0.47)		(-0.43)	(-0.11)		(0.10)
σ_{er}			8.56			50.15			11.89			33.55
			(1.28)			(3.48)			(0.82)			(0.49)
R^2	0.03	0.10	0.11	0.02	0.16	0.43	0.01	0.01	0.05	0.00	0.02	0.02
						Emerging countries						
		88-92			93-97			98-02			03-07	
β		0.06			0.09			0.06			0.11	
		(0.14)			(0.95)			(0.57)			(0.42)	
$\rho(er, \Delta q)$	0.06		-0.33	0.11		0.11	0.14		0.10	0.22		0.22
	(0.37)		(-1.45)	(1.85)		(1.70)	(1.35)		(0.98)	(1.48)		(1.28)
σ_{er}			-2.93			1.31			2.19			0.01
			(-2.20)			(0.53)			(1.37)			(0.00)
R^2	0.02	0.00	0.42	0.30	0.10	0.33	0.19	0.04	0.36	0.22	0.02	0.22

The table reports the results of cross-country OLS regressions of the form $\bar{\mu}^k = \alpha_0 + \alpha_1 \kappa^k + \epsilon^k$ for different country samples and for the time periods 1988-1992, 1993-1997, 1998-2002, 2003-2007. μ^k denotes demeaned state-average of domestic equity holdings. κ^k contains state-specific RER hedging terms listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.5: Domestic Equity Holdings and Real Exchange Rate Hedging, Panel

κ_t^k	88-07			88-97			98-07		
All countries									
β		0.00			-0.01			0.00	
		(0.85)			(-0.64)			(0.52)	
$\rho(er, \Delta q)$	-0.01		-0.01	-0.01		-0.01	-0.02		-0.02
	(-1.12)		(-1.22)	(-0.94)		(-1.19)	(-1.88)		(-1.71)
σ_{er}			-0.87			-0.53			-0.55
			(-3.13)			(-2.86)			(-1.31)
R^2	0.00	0.00	0.012	0.00	0.00	0.03	0.01	0.00	0.02
Industrial countries	88-07			88-97			98-07		
β		0.00			-0.00			0.00	
		(0.50)			(-0.19)			(0.88)	
$\rho(er, \Delta q)$	-0.03		-0.03	-0.00		-0.00	-0.02		-0.02
	(-2.44)		(-2.70)	(-0.44)		(-0.57)	(-1.43)		(-1.434)
σ_{er}			-2.17			-0.84			-0.25
			(-1.99)			(-1.10)			(-0.18)
R^2	0.01	0.00	0.02	0.00	0.00	0.01	0.01	0.00	0.01
Emerging countries	88-07			88-97			98-07		
β		0.02			0.04			0.00	
		(1.31)			(1.47)			(0.11)	
$\rho(er, \Delta q)$	0.01		0.01	0.01		0.01	0.00		-0.00
	(1.55)		(1.52)	(0.84)		(0.72)	(0.17)		(-0.04)
σ_{er}			-0.18			-0.29			0.23
			(-1.06)			(-1.53)			(0.97)
R^2	0.01	0.01	0.012	0.01	0.02	0.03	0.00	0.00	0.01

The table reports the results of panel OLS regressions of the form $\mu_t^k = \alpha_0 + \alpha_1 \kappa_t^k + \epsilon_t^k$ for different country samples and for the time period 1988-2007 and two sub-periods 1988-1997 and 1998-2007. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k and each year, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.5: Domestic Equity Holdings and Real Exchange Rate Hedging, Panel, continued

	EMU countries								
κ_t^k	88-07			88-97			98-07		
β		0.00			-0.01			0.00	
		(0.70)			(-0.72)			(0.92)	
$\rho(er, \Delta q)$	-0.02		-0.02	-0.01		-0.01	-0.02		-0.03
	(-1.21)		(-1.38)	(-0.74)		(-0.89)	(-1.06)		(-1.07)
σ_{er}			-1.58			-0.84			-0.31
			(-1.12)			(-0.92)			(-0.14)
R^2	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01

	Non-EMU countries								
	88-07			88-97			98-07		
β		-0.01			0.00			-0.00	
		(-0.69)			(0.38)			(-0.11)	
$\rho(er, \Delta q)$	-0.03		-0.03	-0.00		0.00	-0.01		-0.01
	(-2.64)		(-2.76)	(-0.01)		(0.00)	(-1.25)		(-1.24)
σ_{er}			-3.97			-0.62			-0.05
			(-2.02)			(-0.33)			(-0.04)
R^2	0.03	0.00	0.05	0.00	0.00	0.00	0.02	0.00	0.02

The table reports the results of panel OLS regressions of the form $\mu_t^k = \alpha_0 + \alpha_1 \kappa_t^k + \epsilon_t^k$ for different country samples and for the time period 1988-2007 and two sub-periods 1988-1997 and 1998-2007. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k and each year, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.6: Domestic Equity Holdings, Real Exchange Rate Hedging and Trade Openness, Cross-Section

κ^k	All countries, 88-07							
β					0.18	0.15		
					(1.67)	(1.45)		
$\rho(er, \Delta q)$			0.40	0.35			0.31	0.28
			(3.44)	(2.87)			(2.81)	(2.48)
σ_{er}							7.89	7.87
							(2.58)	(2.52)
TO_o*100	-0.05		-0.04		-0.04		-0.03	
	(-1.37)		(-1.48)		(-1.32)		(-1.06)	
TO_r*100		-0.43		-0.26		-0.38		-0.15
		(-2.17)		(-1.42)		(-1.93)		(-0.87)
R^2	0.07	0.15	0.36	0.35	0.16	0.21	0.49	0.49

The table reports the results of cross-country OLS regressions of the form $\bar{\mu}^k = \alpha_0 + \alpha_1 \kappa^k + \epsilon^k$ for the time period 1988-2007 and the full country sample. μ^k denotes demeaned state-average of domestic equity holdings. κ^k contains state-specific RER hedging terms and trade openness measures listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. TO_o=$\frac{Imp+Exp}{GDP}$, TO_r=$TradeFreedom$. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.7: Domestic Equity Holdings, Real Exchange Rate Hedging and Financial Openness, Cross-Section

κ^k	All countries (w/o CHE), 88-07							
β					0.16	0.13		
					(1.95)	(1.34)		
$\rho(er, \Delta q)$			0.28	0.28			0.27	0.24
			(2.75)	(2.39)			(2.63)	(2.18)
σ_{er}							2.10	6.36
							(0.55)	(2.06)
FO_1	-0.08		-0.07		-0.08		-0.06	
	(-4.61)		(-3.97)		(-4.69)		(-2.44)	
FO_2		-0.0048		-0.0036		-0.0045		-0.0025
		(-3.71)		(-2.71)		(-3.44)		(-1.89)
R^2	0.44	0.34	0.57	0.46	0.51	0.38	0.57	0.54

The table reports the results of cross-country OLS regressions of the form $\bar{\mu}^k = \alpha_0 + \alpha_1 \kappa^k + \epsilon^k$ for the time period 1988-2007 and the full country sample. μ^k denotes demeaned state-average of domestic equity holdings. κ^k contains state-specific RER hedging terms and financial openness measures listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. FO_1^k=$KAOPEN$ provided by Chinn and Ito, $FO_2^k = FinancialFreedom$ from Heritage Foundation. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.8A: Domestic Equity Holdings, Real Exchange Rate Hedging and Trade Openness, Panel

	All countries															
κ_t^k	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)	(XIII)	(XIV)	(XV)	(XVI)
β									0.00	0.00	0.00	0.01				
									(0.80)	(0.36)	(0.88)	(0.66)				
$\rho(er, \Delta q)$					-0.01	-0.01	-0.01	-0.02					-0.01	-0.01	-0.01	-0.03
					(-1.17)	(-0.71)	(-0.76)	(-0.76)					(-1.26)	(-0.60)	(-0.61)	(-1.39)
σ_{er}													-0.82	2.07	-0.50	6.09
													(-2.96)	(3.69)	(-1.11)	(5.09)
TO_o*100	-0.05	-0.05			-0.05	-0.05			-0.05	-0.05			-0.05	-0.04		
	(-2.51)	(-5.34)			(-2.53)	(-5.36)			(-2.49)	(-5.33)			(-2.32)	(-5.14)		
TO_r*100			-0.02	-0.48			-0.02	-0.48			-0.02	-0.48			-0.02	-0.44
			(-0.26)	(-6.96)			(-0.31)	(-6.99)			(-0.29)	(-6.94)			(-0.25)	(-6.57)
R^2	0.01	0.05	0.00	0.12	0.01	0.05	0.00	0.12	0.01	0.06	0.00	0.12	0.03	0.07	0.01	0.18
δ^k	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
Obs.	600	600	360	360	600	600	360	360	600	600	360	360	600	600	360	360

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1\kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for the full country sample. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms and trade openness measures listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k and each year, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. $TO_o^{k,t}$=$\frac{Imp^{k,t}+Exp^{k,t}}{GDP^{k,t}}$, $TO_r^{k,t}$=$TradeFreedom$. In specifications with $TO_o^{k,t}$ the data range from 1988 to 2007 and with $TO_r^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.8B: Domestic Equity Holdings, Real Exchange Rate Hedging and Trade Openness, Panel

κ_t^k	Industrial countries						Emerging countries					
$\rho(er, \Delta q)$			-0.03	-0.01	-0.03	-0.01			0.01	0.00	0.01	0.00
			(-2.44)	(-1.07)	(-2.70)	(-1.12)			(1.49)	(0.31)	(1.47)	(0.06)
σ_{er}					-2.11	-0.73					-0.15	0.24
					(-1.94)	(-0.50)					(-0.85)	(0.95)
TO_o*100	-0.04		-0.04		-0.04		-0.04		-0.04		-0.03	
	(-1.88)		(-1.86)		(-1.80)		(-1.25)		(-1.18)		(-0.99)	
TO_r*100		-0.40		-0.42		-0.41		-0.01		-0.01		-0.01
		(-1.89)		(-1.95)		(-1.93)		(-0.21)		(-0.16)		(-0.24)
R^2	0.01	0.01	0.02	0.02	0.03	0.02	0.01	0.00	0.02	0.00	0.02	0.01
Obs.	400	240	400	240	400	240	200	120	200	120	200	120

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for differentl country samples. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms and trade openness measures listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β appears never statistically significant, that is why it is not reported. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. $TO_o^{k,t}$=$\frac{Imp^{k,t}+Exp^{k,t}}{GDP^{k,t}}$, $TO_r^{k,t}$=$TradeFreedom$. In specifications with $TO_o^{k,t}$ the data range from 1988 to 2007 and with $TO_r^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.9A: Domestic Equity Holdings, Real Exchange Rate Hedging and Trade Openness, Panel

κ_t^k	All countries											
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
$\rho(er, \Delta q)$	-0.01	-0.01	-0.01	-0.02					-0.01	-0.01	-0.00	-0.03
	(-1.16)	(-0.65)	(-0.61)	(-0.58)					(-1.23)	(-0.82)	(-0.45)	(-1.09)
σ_{er}					-0.92	0.54	-0.50	0.74	-0.90	3.90	-0.52	6.39
					(-2.24)	(1.47)	(-1.10)	(1.37)	(-2.18)	(5.15)	(-1.12)	(5.13)
TO_o*100	-0.06	-0.04			-0.05	-0.29			-0.05	-0.05		
	(-2.37)	(-3.75)			(-2.19)	(-14.73)			(-2.05)	(-4.63)		
TO_r*100			0.07	-0.38			0.00	-0.58			0.09	-0.41
			(0.70)	(-4.05)			(0.03)	(-5.65)			(0.76)	(-4.28)
$TO_o * \rho(er, \Delta q)$*100	0.02	-0.05							0.01	-0.06		
	(0.27)	(-2.39)							(0.14)	(-2.91)		
$TO_r * \rho(er, \Delta q)$*100			-0.37	-0.38							-0.38	-0.33
			(-1.39)	(-1.72)							(-1.41)	(-1.53)
$TO_o * \sigma_{er}$*100					1.48	14.08			1.04	5.11		
					(0.36)	(4.44)			(0.25)	(3.39)		
$TO_r * \sigma_{er}$*100							-4.27	41.67			-1.41	17.49
							(-0.31)	(2.48)			(-0.10)	(1.37)
R^2	0.01	0.06	0.00	0.13	0.02	0.27	0.00	0.09	0.03	0.10	0.01	0.19
δ^k	yes	no	yes	no	yes	no	yes	no	yes	no	no	no
Obs.	600	600	360	360	600	600	360	360	600	600	360	360

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for the full country sample. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms, trade openness measures and their interaction terms, that are listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β appears never statistically significant, that is why it is not reported. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. $TO_o^{k,t}=\frac{Imp^{k,t}+Exp^{k,t}}{GDP^{k,t}}$, $TO_r^{k,t}=TradeFreedom$. In specifications with $TO_o^{k,t}$ the data range from 1988 to 2007 and with $TO_r^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.9B: Domestic Equity Holdings, Real Exchange Rate Hedging and Trade Openness, Panel

κ_t^k	Industrial countries						Emerging countries					
ρ	-0.03	-0.01			-0.03	-0.01	0.01	0.00			0.01	-0.00
	(-2.45)	(-0.73)			(-2.68)	(-0.97)	(1.49)	(0.07)			(1.16)	(-0.35)
σ_{er}			-2.44	-0.06	-2.83	-0.41			0.23	0.26	0.19	0.31
			(-2.23)	(-0.04)	(-2.58)	(-0.29)			(0.81)	(1.05)	(0.64)	(1.20)
TO_o*100	-0.04		-0.10		-0.10		-0.06		0.00		-0.01	
	(-1.53)		(-3.47)		(-3.14)		(-1.18)		(0.02)		(-0.23)	
TO_r*100		0.21		0.23		1.01		-0.06		0.00		-0.05
		(0.85)		(0.61)		(2.54)		(-1.09)		(0.02)		(-0.86)
$TO_o * \rho$*100	-0.03				-0.02		0.05				0.03	
	(-0.43)				(-0.24)		(0.50)				(0.25)	
$TO_r * \rho$*100		-2.47				-2.59		0.21				0.25
		(-4.38)				(-4.62)		(1.37)				(1.59)
$TO_o * \sigma_{er}$			0.30		0.30				-0.05		-0.04	
			(3.19)		(3.14)				(-1.66)		(-1.37)	
$TO_r * \sigma_{er}$				-2.84		-3.44				-0.02		-0.05
				(-2.02)		(-2.54)				(-0.35)		(-0.81)
R^2	0.02	0.09	0.04	0.03	0.06	0.12	0.02	0.02	0.03	0.01	0.03	0.03
Obs.	400	240	400	240	400	240	200	120	200	120	200	120

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for different country samples. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms, trade openness measures and their interaction terms, that are listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β appears never statistically significant, that is why it is not reported. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. $TO_o^{k,t} = \frac{Imp^{k,t} + Exp^{k,t}}{GDP^{k,t}}$, $TO_r^{k,t} = TradeFreedom$. In specifications with $TO_o^{k,t}$ the data range from 1988 to 2007 and with $TO_r^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.9C: Domestic Equity Holdings, Real Exchange Rate Hedging and Trade Openness, Panel

κ_t^k	EMU countries						Non-EMU countries					
ρ	-0.02	-0.02			-0.02	-0.02	-0.03	-0.00			-0.03	-0.00
	(-1.28)	(-0.89)			(-1.26)	(-1.01)	(-2.80)	(-0.30)			(-3.01)	(-0.27)
σ_{er}			1.01	1.20	0.19	0.91			-2.10	-0.61	-2.48	-1.42
			(0.49)	(0.54)	(0.09)	(0.43)			(-1.07)	(-0.35)	(-1.29)	(-0.79)
TO_o*100	-0.42		-0.13		-0.34		-0.03		-0.11		-0.10	
	(-3.18)		(-0.91)		(-2.14)		(-1.29)		(-4.35)		(-3.59)	
TO_r*100		0.29		1.46		2.08		0.05		-0.52		0.08
		(0.74)		(1.87)		(2.76)		(0.14)		(-1.60)		(0.19)
$TO_o * \rho$*100	0.94				0.89		-0.11				-0.08	
	(2.73)				(2.57)		(-1.79)				(-1.48)	
$TO_r * \rho$*100		-3.67				-3.79		-1.33				-1.45
		(-3.87)				(-4.08)		(-2.02)				(-2.14)
$TO_o * \sigma_{er}$			-0.64		-0.39				0.33		0.32	
			(-1.21)		(-0.73)				(3.86)		(3.76)	
$TO_r * \sigma_{er}$				-7.11		-7.64				0.21		0.13
				(-2.40)		(-2.75)				(0.17)		(0.10)
R^2	0.06	0.12	0.03	0.05	0.07	0.18	0.07	0.08	0.11	0.05	0.16	0.09
Obs.	200	120	200	120	200	120	200	120	200	120	200	120

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for different country samples. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms, trade openness measures and their interaction terms, that are listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β appears never statistically significant, that is why it is not reported. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data. $TO_o^{k,t} = \frac{Imp^{k,t}+Exp^{k,t}}{GDP^{k,t}}$, $TO_r^{k,t} = TradeFreedom$. In specifications with $TO_o^{k,t}$ the data range from 1988 to 2007 and with $TO_r^{k,t}$ from 1996 to 2007 due to data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.10A: Domestic Equity Holdings, Real Exchange Rate Hedging and Financial Openness, Panel

κ_t^k	All countries											
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
$\rho(er, \Delta q)$					-0.01	-0.00	-0.01	-0.02	-0.01	-0.00	-0.01	-0.03
					(-1.15)	(-0.12)	(-0.77)	(-0.69)	(-1.26)	(-0.13)	(-0.63)	(-1.18)
σ_{er}									-0.98	-0.15	-0.49	4.44
									(-3.47)	(-0.30)	(-1.11)	(3.89)
FO_1	-0.01	-0.06			-0.01	-0.06			-0.01	-0.06		
	(-2.82)	(-14.43)			(-2.83)	(-14.42)			(-3.23)	(-13.79)		
FO_2*100			-0.04	-0.49			-0.04	-0.49			-0.04	-0.45
			(-0.98)	(-10.91)			(-1.00)	(-10.92)			(-0.98)	(-9.96)
R^2	0.01	0.27	0.00	0.25	0.02	0.27	0.00	0.25	0.04	0.27	0.01	0.28
δ^k	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
Obs.	580	580	360	360	580	580	360	360	580	580	360	360

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for the full country sample. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms and financial openness measures, that are listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β appears never statistically significant, that is why it is not reported. σ_{er} denotes a variance of excess retuns. Real exchange rate hedging terms are computed using monthly data.$FO_1^{k,t}$=$KAOPEN$ provided by Chinn and Ito, $FO_2^{k,t} = Financial Freedom$ from Heritage Foundation. In specifications with $FO_1^{k,t}$ the data range from 1988 to 2007 and CHE is excluded and with $FO_2^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.10B: Domestic Equity Holdings, Real Exchange Rate Hedging and Financial Openness, Panel

κ_t^k	Industrial countries							
β					0.00	0.00		
					(0.45)	(0.99)		
$\rho(er, \Delta q)$			-0.03	-0.01			-0.03	-0.01
			(-2.64)	(-0.96)			(-2.87)	(-1.01)
σ_{er}							-2.09	-0.77
							(-1.88)	(-0.52)
FO_1*100	1.01		1.12		1.01		0.94	
	(1.36)		(1.51)		(1.36)		(1.26)	
FO_2*100		0.01		0.01		0.02		0.01
		(0.23)		(0.22)		(0.29)		(0.16)
R^2	0.01	0.00	0.02	0.00	0.01	0.00	0.03	0.01
Obs.	380	240	380	240	380	240	380	240

κ_t^k	Emerging countries							
β					0.02	-0.00		
					(1.61)	(-0.16)		
$\rho(er, \Delta q)$			0.01	0.00			0.01	0.00
			(1.31)	(0.43)			(1.24)	(0.19)
σ_{er}							-0.31	0.23
							(-1.89)	(0.92)
FO_1*100	-1.43		-1.41		-1.46		-1.50	
	(-4.8)		(-4.72)		(-4.90)		(-4.99)	
FO_2*100		0.03		0.03		0.03		0.03
		(1.31)		(1.33)		(1.31)		(1.32)
R^2	0.10	0.01	0.11	0.02	0.12	0.01	0.13	0.02
Obs.	200	120	200	120	200	120	200	120

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for different country samples. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms and financial openness measures, that are listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k and each year, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. Real exchange rate hedging terms are computed using monthly data.$FO_1^{k,t}$=$KAOPEN$ provided by Chinn and Ito, $FO_2^{k,t} = FinancialFreedom$ from Heritage Foundation. In specifications with $FO_1^{k,t}$ the data range from 1988 to 2007 and CHE is excluded and with $FO_2^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

Table 3.10C: Domestic Equity Holdings, Real Exchange Rate Hedging and Financial Openness, Panel

κ_t^k	EMU countries							
β					0.00	0.00		
					(0.74)	(1.01)		
$\rho(er, \Delta q)$			-0.02	-0.02			-0.02	-0.02
			(-1.10)	(-0.71)			(-1.22)	(-0.73)
σ_{er}							-1.07	-0.45
							(-0.77)	(-0.20)
FO_1*100	3.61		3.56		3.62		3.46	
	(3.31)		(3.27)		(3.31)		(3.15)	
FO_2*100		0.08		0.07		0.09		0.06
		(0.68)		(0.59)		(0.80)		(0.53)
R^2	0.05	0.00	0.06	0.01	0.06	0.01	0.06	0.01
Obs.	200	120	200	120	200	120	380	120

κ_t^k	Industrial non-EMU countries							
β					-0.01	0.01		
					(-0.35)	(0.78)		
$\rho(er, \Delta q)$			-0.03	-0.01			-0.03	-0.01
			(-2.28)	(-0.57)			(-2.41)	(-0.59)
σ_{er}							-4.90	-0.85
							(-2.51)	(-0.50)
FO_1*100	-4.30		-3.86		-4.25		-4.13	
	(-3.75)		(-3.35)		(-3.66)		(-3.63)	
FO_2*100		-0.06		-0.06		-0.07		-0.06
		(-1.03)		(-0.96)		(-1.13)		(-0.93)
R^2	0.07	0.01	0.10	0.01	0.07	0.01	0.13	0.01
Obs.	180	120	180	120	180	120	180	120

The table reports the results of panel OLS regressions of the form $\bar{\mu_t}^k = \alpha_0 + \alpha_1 \kappa_t^k + \tau_t + \delta^k + \epsilon_t^k$ for the time period 1988-2007 and for different country samples. Regressions are estimated using annual data. μ_t^k denotes domestic equity holdings. κ_t^k contains RER hedging terms and financial openness measures, that are listed in the first column. $\rho(er, \Delta q)$ is a correlation between excess returns and real exchange rate changes. β denotes *beta*-coefficient in the time-series regression of real exchange rate changes on excess returns estimated for every state k and each year, it is formally equal to $\frac{cov(er,\Delta q)}{\sigma_{er}}$. Real exchange rate hedging terms are computed using monthly data.$FO_1^{k,t}$=$KAOPEN$ provided by Chinn and Ito, $FO_2^{k,t} = FinancialFreedom$ from Heritage Foundation. In specifications with $FO_1^{k,t}$ the data range from 1988 to 2007 and CHE is excluded and with $FO_2^{k,t}$ from 1996 to 2007 due to the data availability. Constants α_0 are not reported. T-statistics are in parenthesis.

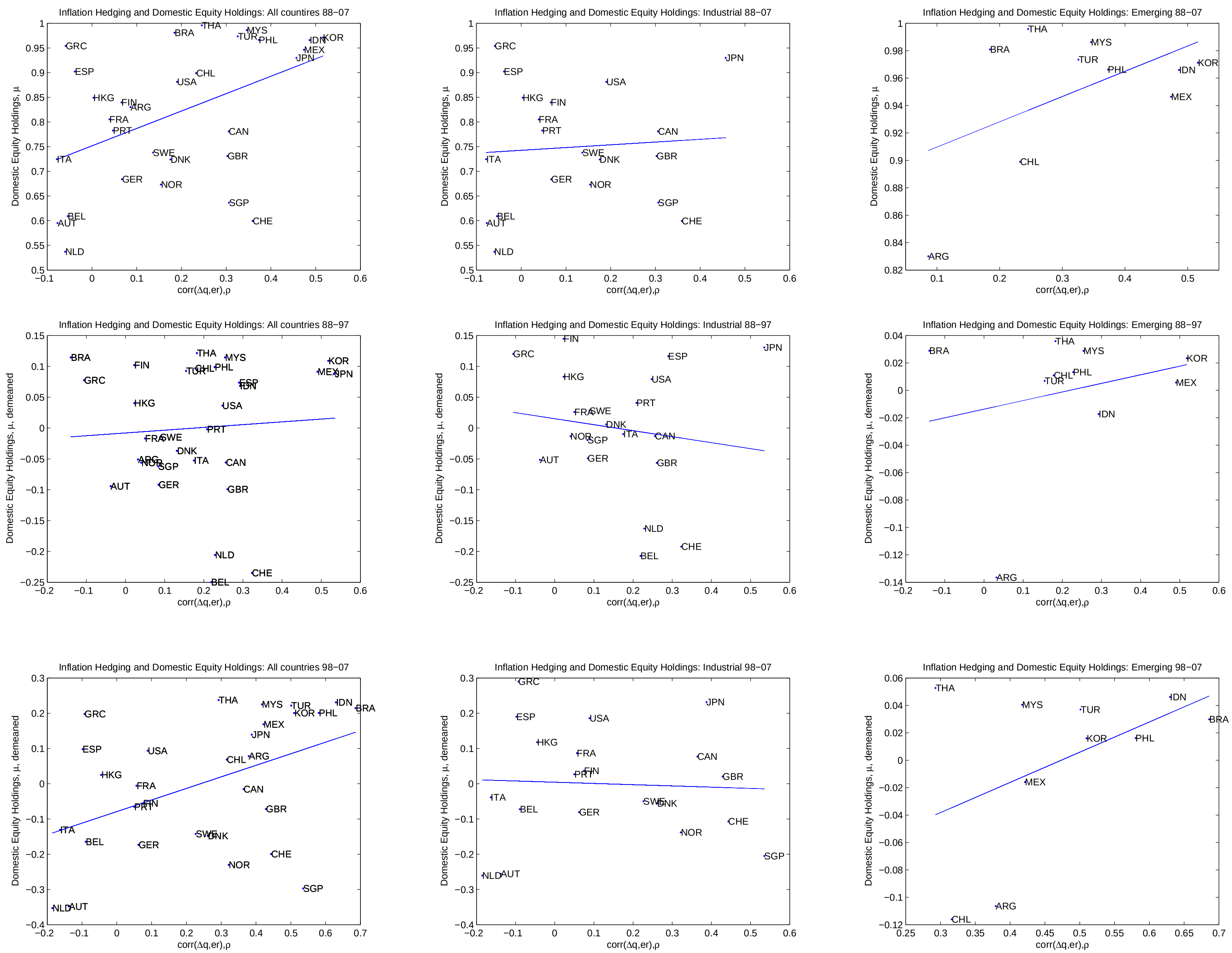

FIGURE 3:These figures show scatter plots of correlations of excess returns and real exchange rate changes against corresponding domestic equity holdings.

Chapter 4

Effects of Financial Development on Capital Flows after Financial Liberalization across US States[56]

4.1 Introduction

The issue of global financial imbalances have been intensely addressed in international economic policy and academic discussions over recent years. Large and growing literature attempts to explain not only the swelling current account deficit in the United States of America, but also the decline in the net foreign asset (NFA) position accompanied by increased holdings of risky assets and a large increase in debt.

So far, the facts of global imbalances are basically recognized, but there is still no consensus on the sources and drivers of these imbalances and the perspectives for their further evolvements. Several theories have been suggested, but none is able to fully explain them. Most recent prominent studies (Mendoza et al. (2009), Caballero et al. (2008), Song et al. (2010)) provide a new explanation for both, the changes in NFA positions and the changes in the portfolio structure across advanced and emerging economies. They

[56] This chapter follows Stewen (2010b).

show that heterogeneity in the level of domestic financial market development across countries may generate both, the large imbalances as well as the composition of the imbalances. In particular, this heterogeneity starts to play a significant role as economies commence integration into a international economy through capital flows, trade and foreign direct investments.

Development of financial systems differed remarkably across countries and this is still the case even after the globalization of capital markets has progressed recently. Moreover, capital market liberalization/integration has triggered strongly increased capital flows between advanced and emerging capital markets. According to the above mentioned papers, it is essentially the interaction between domestic market development and globalization that has generated global imbalances. The driving mechanism are precautionary savings: due to financial market imperfections, in particular low financial contract enforcement, financial markets cannot provide full insurance against idiosyncratic risk, and thus induce people to "oversave" when faced with uncertainty about future income. In autarky, financially less developed countries have higher precautionary savings and lower interest rate than more developed countries. When economies become financially integrated, interest rates are equalized. And capital flows from emerging countries to developed ones, which results in negative NFA positions in advanced economies and positive NFA in emerging ones. Furthermore, differences in financial market development are also able to explain the composition of the international portfolios. Whereas emerging countries demand rather safe assets, i.e. US bonds, because they have to bear a lot of uninsurable idiosyncratic risk, countries with well developed financial markets can invest in high-return, risky assets, i.e. equities.

While the facts and fears of global imbalances are unambiguously obvious, it is still not clear what the implications of them are supposed to be and at which costs the adjustments would take place. This chapter suggests to look at US states and at the liberalization process that US states have passed through after state banking deregulation in the early 80s. Thus, we draw the parallels of global imbalances and international capital flows that arose with globalization to the imbalances within US states and US-wide capital flows emerged during and after state banking deregulation in the US. The way intra- and interstate deregulations have been implemented across US states offers a great opportunity to use the experience of the United States as a natural laboratory to study not only the accruement of global imbalances but also their consequences.

Since 1970s, US states relaxed restrictions that permitted branching both within and across states. Intra- and interstate branching and de-novo banking deregulations have taken place gradually across states. Since there is no fixed chronological order (sequencing) for the deregulations being implemented, there are some states that have accomplished intrastate deregulation prior to interstate deregulation and others that have proceeded vice versa. Thus, both banking deregulations and their chronological order provide a large source of variation across states and time and enable us to differentiate between two groups of states. Moreover, the time span between intra- and interstate deregulation varies a lot across states. In this way, we also have variation in the level of financial development across states at the time of interstate banking deregulation that could be considered as a national financial liberalization or integration. Here, the level of state's financial development is suggested to be proxied by its year of intrastate deregulation. To the best of my knowledge, there is no standard indicators measuring local financial development of US states. Traditionally, local financial development is captured by outcome-based measures like banks per capita, mortgage interest rate, debt to value ratio, mortgage credit to deposit ratio etc. Therefore, this chapter offers the first rule-based measure of local financial development of US states.

In this chapter, I explore the interaction between domestic financial development and globalization using a US data set. In particular, I examine how interstate banking deregulation has altered savings, consumption and net income flows for both, liberalized and non-liberalized states. The novelty lies in the idea to make use of gradual inter- and intrastate banking deregulation in the US to study adjustments of national imbalances after financial liberalization. The main contribution of this chapter is to figure out and document a set of stylized empirical facts emerging from the analysis of capital flows across US states whose states have already gone through integration process. The experience of the US is used to highlight how economic interactions *between* countries could evolve as financial borders decline in importance. This contribution is empirical and seeks to address the following research questions: Can we observe the mechanisms proposed in the theoretical literature at the interstate level? What is the direction of capital flows among US states following deregulation?

The answer to the first question is unambiguous yes. I find the predictions of the theoretical model of Mendoza et al. clearly confirmed by the US data: states with more developed financial markets experienced an increase in the income/output ratio and a decrease in the income/consumption ratio following interstate banking deregulation. This results suggest that more developed states invest rather in productive (risky) assets but also accumulate foreign debt. Moreover, in less financially developed states savings increased after interstate banking deregulation indicating positive holdings of riskless assets.

Mendoza et al. (2009) emphasize that adjustment in NFA positions is a long-lasting process. To this notion, I find evidence that higher financial development, in our case the fact of having implemented intrastate deregulation prior to interstate deregulation, has rather long-lasting effects on the pattern of net capital flows.

The remainder of the chapter is organized as follows. Section 2 gives an overview of the recent relevant literature. Section 3 presents three benchmark models providing their distinguishing features and the predictions they made with respect to the pattern of net capital flows. In section 4 I focus on the empirical analysis. Section 6 concludes.

4.2 Literature overview

Global imbalances have been analyzed from a number of angles over the last ten years. Initially, only large US current account deficit and its sustainability were addressed by the literature (Dooley et al. (2004), Edwards (2005), Cooper (2001)). Lately, academics and policy-makers started to seek for more fundamental explanations for these imbalances. Some of them (Summers (2004), Obstfeld and Rogoff (2004), Blanchard, Giavazzi and Sa (2005), Krugmann (2007)) advance a view that the imbalances are likely to generate far-ranging financial disturbances. Other indicate that global imbalances are a pure outcome of diverse influencing factors. Fogli and Perri (2006) argue that "great moderation" helps explain large US external imbalances. Cavallo and Tille (2006), Gourinchas and Rey (2007) and Ghironi, Lee and Rebucci (2009) propose valuation effects to be a source for the observed imbalances. Other reasons for these imbalances are suggested to be demographic transition (Attanasio et al. (2006)), valuation changes of possibly unaccounted assets ("dark matter" of Hausmann and Sturzenegger (2006), McGrattan and Prescott (2007)), a "global saving glut" (Bernanke (2005)), interaction of structural and cyclical determinants (Bracke et al. (2008)), or differences in productivity growth combined with financial integration (Chakraborty and Deckle (2007), Caballero et al. (2008)). However, Engel and Rogers (2006) conclude that US current account deficits are near their optimal positions and are just "the outcome of optimizing behaviour".

At the heart of this chapter is growing prominent literature that emphasizes a tight link between financial market imperfections in fast-growing emerging economies and rapid process of financial globalization that produces external imbalances. Already mentioned Mendoza, Quadrini and Ríos-Rull (2009) show that financial imperfections affect the demand for assets. They also underline the role of uncertainty in their framework, that accounts for the emergence of imbalances. In contrast, Caballero et al. (2008) develop a model with financial imperfections bearing on the country's ability to supply assets. Whereas in Caballero et al.'s model differential shocks to productivity growth and to the financial structure generate the imbalances, the underlying driving force of Mendoza et al.'s model is indeed the interaction of the financial integration and the differences in the levels of financial development of economies. This mechanism was initially proposed by Willen (2004) to explain trade imbalances across countries. Prades and Rabitsch (2007) also show that financial market imperfections–in their case, specified through borrowing and lending constraints–may generate current financial imbalances.

A recent theoretical paper by Ghironi and Stebunovs (2008) also highlights the role of the interaction between domestic financial development and globalization in explaining external imbalances. However, it is the first paper, that actually studies *international* dimension of *intranational* deregulation. The model of Ghironi and Stebunovs–as those mentioned before–predicts in the steady state higher consumption and output, a real exchange rate appreciation, a current account deficit and net foreign debt positions for more developed countries. Nevertheless, their model does not differentiate between inter- and intrastate deregulation and thus does not really exploit the implications that this distinction could entail.

The impact of US banking deregulation on macroeconomic factors is addressed by numerous empirical studies. Jayaratne and Strahan (1996) show that intrastate banking deregulation has significantly raised real per capita output and income growth. The paper of Morgan, Rime and Strahan (2004) provides evidence that after interstate banking deregulation volatility of state business cycles has declined and the business cycles of deregulated states have started to converge.

The more recent literature on banking deregulation emphasizes its role in risk sharing across US states (Demyanyk, Ostergaard and Sørensen (2007), Acharya, Imbs and Sturgess (2006)). The paper by Hoffmann and Shcherbakova-Stewen (2010) (henceforth, HSS) argues that intrastate banking deregulation has not improved overall interstate risk sharing but it has dampened the dependence of the degree of risk sharing on business cycle. They have found out that banking deregulation has changed the pattern of risk sharing: income smoothing through net income flows (or in other words, through capital markets) has increased but consumption smoothing via credit market (or savings) has decreased, so that overall risk sharing has not been affected by banking deregulation. Moreover, the authors have shown that it is indeed intrastate deregulation that has changed the pattern of risk sharing. However, HSS do not provide a concrete mechanism that drives their results.

This chapter is also related to the literature studying local financial development and its implications within a single country. While there is a large literature on financial development and its implications across countries, the range of papers focusing on within country differences is very limited. The most allied study exploring local financial development of US states is a recent papers by Rajan and Ramcharan (2009) and Dehejia and Lleras-Muney (2003). Rajan and Ramcharan (2009) argue that the distribution of land in the US has influenced the extent of financial development. During the period 1900-1940, counties with high land concentration had fewer banks per capita, higher interest rates and lower loan to value ratios, which suggests more restricted access to finance. Unfortunately, to date there is no any standard indicators measuring financial development of every single state in the US.

The general set-up of the current chapter have to be separated from the story of Kalemli-Ozcan et al. (2006). They argue that capital flows from developed states with low marginal productivity of capital to less developed states with high marginal productivity of capital. Hence, allocation of capital across states is solely determined by levels of total factor productivity. Moreover, they restrict their analysis to net income flows, without taking into account the whole portfolio composition.

Moreover, this work is related to studies that investigate the potential role of small firms in the emergence of global imbalances. Song, Storesletten and Zilibotti (2010) emphasize that imperfections in financial markets work through small businesses, and in particular their access to financial markets, so that less financially developed countries with lots of small firms would accumulate a foreign surplus. The role of small firms access to credit markets is also addressed by HSS. They show that the effect of banking deregulation on the pattern of risk sharing is more pronounced among states where small firms play particularly important role as employer or where the income of small business owners accounts for a large share of state personal income.

4.3 Theoretical background

The models of Mendoza, Quadrini and Ríos-Rull (henceforth, MQRR), Caballero, Fahri and Gourinchas (henceforth, CFG) and Ghironi and Stebunovs (henceforth, GS) make use of the interaction between domestic financial development and financial integration when explaining global imbalances. However, these models differ in the driving mechanisms that cause imbalances. Yet, they provide a useful theoretical framework to study the emergence of global imbalances and predict the development of macroeconomic variables. This section offers a brief description of the above mentioned models, their distinguishing features and the predictions which these models make with respect to some important macroeconomic variables.

The MQRR model

The model proposed by Mendoza et al. (2009) is a multi-country dynamic stochastic general equilibrium model with incomplete asset markets. In this model, countries that commence financial integration differ only with respect to their financial development. Mendoza et al. define financial development as the extent of enforcement of financial contracts among residents by the law of the country of residence, which is represented by the fraction of individual income that the country's residents can divert from creditors. Thus, financial imperfections directly affect the degree to which individuals can insure against idiosyncratic risks. That in turn has impact on savings - in particular, precautionary savings - and followingly, on the demand for assets. Moreover, the authors also introduce two types of uncertainty or risk: endowment or labor income risk and investment or capital income risk. This set-up renders possible to distinguish risky from riskless investments, and thus allows us to study the composition of NFA positions.

The MQRR model predicts that regardless of the nature of uncertainty–endowment, investment or both–in autarky more financially developed country has higher interest rate and lower asset prices than less financially developed country. When countries become financially integrated, financially more developed country experiences a fall in the interest rate, the demand for assets and savings, and accumulates negative NFA. In the case of negative endowment shock, more financially developed country holds zero net positions in the productive asset, but in the case of investment shock, this position is positive. However, with both endowment and investment shocks, the NFA position of a more developed country is not necessarily negative. The sign of NFA position depends on the importance of the two shocks: only if the endowment shock is sufficiently large, more developed country will hold a negative NFA position. In addition, the model suggests that a financially more developed country experiences large imbalances only if the economy of the less developed country is relatively large. The model also predicts that net holdings of risky assets increases with net worth: it is negative for poorer countries and positive for richer countries. As countries become wealthier, they invest more in less developed countries because they assign higher weight on returns and less on risk.

Quantitative analysis reveals that by combining endowment and investment shocks the model is able to reconcile existing patterns of US international financial position: more financially developed country accumulates negative NFA, invests in riskier assets and experiences a fall in the interest rate relative to autarky. However, it overstates to some extent the adjustment observed in the US economy. Furthermore, the model provides useful insights into the transitional dynamics from autarky to full financial integration for several aggregate variables. In particular, NFA in more developed country decreases slowly and gradually during about 30 years; current account drops to a deficit and remains there until it converges to zero in about 50 years. Whereas the amount of productive assets increases immediately after opening up the economy, foreign debt decreases even more resulting in negative NFA positions. Net factor payments from abroad remain positive for about five years and become negative afterwards in more developed country.

The CFG model

Similarly to Mendoza et al. (2009), Caballero, Fahri and Gourinchas have developed detailed model showing how different levels of financial market development in different regions, combined with financial market integration, can yield patterns of global imbalances observed today. In particular, they adopt the framework of a general equilibrium model with two financially open regions, one emerging and the other developed, so that safe assets are only provided in the developed region. Fast growth in the emerging region and its inability to produce safe assets increases its demand for the safe assets from the developed region. Thus, the CFG model emphasizes the role of heterogeneity across countries in the ability to *supply* financial assets. It gives a rationale for a decline in real interest rates, for an equilibrium transfer of capital from the excess savings countries to the low-savings advanced countries, especially the US, and for an increase in the importance of US assets in global portfolio.

The CFG model suggests that a permanent shock to the financial development of emerging region - e.g. a sharp decline in the protection of property rights or a crash in a bubble or a considerable loss of informed and intermediation capital - results in a permanent fall of the interest rate and the current account deficit in the developed region. This deficit is the counterpart of the increasing flows from the emerging region. After the shock, households in the emerging region save more but at the same time have few reliable local assets, so that they are forced to invest into the safer assets from the developed region. In addition, the model also sheds light on the important trends: it provides implications of financial integration of fast growing, less developed regions. In autarky, the interest rate of a less developed region is lower than the interest rate of a more developed one. When a less developed region starts to grow faster and becomes financially integrated, its demand for financial assets increases. Since the ability of emerging region to generate safe financial assets does not change, demand for assets from developed region increases. This entails rising prices of developed region's asset, a drop in the interest rate and persistent current account deficit.

The GS model

Ghironi and Stebunovs (2008) provide a model that studies occurrence of *international* imbalances as a result of *intranational* banking deregulation in the US. They employ a two-country dynamic stochastic general equilibrium model with local banking competition and endogenous producer entry. The removal of bank market segmentation is suggested to be a main source of global imbalances: deregulation of financial market lifts the restriction on borrowing from banks at a different location and facilitates access to finance by product market entrants, and thus, increases business creation, which in turn leads to higher labor demand and higher real wages, inducing appreciation of real exchange rate. The model predicts that without financial integration lower segmentation of financial markets implies in the long run higher output and consumption at home and abroad. In the short run, home consumption decreases as households increase deposits into banks in order to finance the entry of new firms. Foreign consumption and output fall as well in the short run.

Opening of the economy, which allows international deposit trading, initially reduces consumption in both countries to finance increased producer entry in the deregulated home economy. 'Home' saves more and additionally borrows from abroad to finance higher investment in new home firms, and thus, accumulates persistent net foreign debt. In the long run, home and foreign consumption increase, where home consumption increases much stronger than foreign one. Though home current account runs deficit, as we expected, it is much less persistent comparing to the real evidence from the US. To increase current account persistence the GS model requires some modification: either to treat the banking deregulation as an anticipated rather than unanticipated event, or to assume that the entry cost depends on the number of existing firms.

4.4 Empirical analysis

Theoretical models predicate that more financially developed regions (in my case, states) will have less precautionary savings and higher interest rate. After opening up the economies, these regions will experience lower interest rate and lower demand for assets, capital outflows and negative net foreign asset positions. But at the same time, they will also have positive net equity holdings and large negative net bond holdings. Thus, savings will decrease further and consumption will increase. In less financially developed regions, interest rate and demand for assets rise, capital flows in and net foreign asset positions become positive with net equity (bond) holdings being negative (positive). This section verifies these predictions empirically using the US data set.

4.4.1 Developed vs. non-developed states

I examine if there were differences in the portfolio composition across liberalized and non-liberalized states prior to interstate banking deregulation. We can split US states into two groups: the first group, developed one, where intrastate deregulation has been conducted before interstate deregulation, and the second group, non-developed one, where intrastate deregulation has taken place after interstate deregulation. In table 4.1B, states are sorted by the year they implemented inter- or intrastate deregulation. It becomes clear that there is a high variability in the timing of both deregulations: on the one hand, 12 states have already relaxed intrastate branching restrictions in the early 60s, others have postponed it till the mid 90s, but almost half of the states have implemented intrastate deregulation in the 80s; on the other hand, it took much less time for US states to implement interstate deregulation all over the country, with majority of states having deregulated in the 80s. Table 4.1A shows that there was no fixed sequencing for the deregulations being implemented, so that there are 32 states that have accomplished intrastate deregulation prior to interstate deregulation, 17 states that have proceeded vice versa and two states that have implemented both deregulations simultaneously.

Thus, we differentiate between two groups of states: the first group includes states (we will refer to them interchangeably as developed or liberalized, or blue) that have already accomplished intrastate deregulation before they undertake interstate deregulation. Therefore, we assume that these states have already had developed financial markets before they opened them for other states. The second group of states (we will refer to them interchangeably as non-developed or non-liberalized, or red) has at first implemented interstate deregulation and later on intrastate deregulation, so that we consider these states as financially underdeveloped at the moment of interstate banking deregulation. Figure 4.1 illustrates the history of intrastate deregulation and also provides an insight on the allocation of developed and non-developed states.

Table 4.1C displays descriptive statistics of both deregulations for developed and non-developed states. Interestingly, the date of intrastate deregulation across developed states ranges from 1963 till 1990 with standard deviation of more than ten years. Though interstate deregulation took place prior to intrastate deregulation across non-developed states, it started later there than across developed states. This indicates that non-developed states were generally late deregulators.

4.4.2 Data

We use the data set for the period 1963-2005 compiled by Hoffmann and Shcherbakova-Stewen (2010). This data set is an updated version of the data constructed by Asdrubali, Sørensen and Yosha (1996).

In order to test the model inferred hypotheses, I proxy net asset holdings, savings and consumption because they are not directly observed. In so doing, net asset holdings are captured through the ratio of state-level personal income (SPI) to gross state product (GSP) (income/output). States with high income/output ratio are associated with positive net equity holdings.[57]

[57] The output/income ratio is an indicator of net capital income flows. If a state accumulates large holdings of productive assets or equities, it experiences positive net capital

To measure savings (or debt), I use the ratio of SPI over state consumption (C) (income/consumption). The income/consumption ratio is low for states with low savings and small bond holdings. Consumption is measured relative to gross state product (consumption/output). This procedure has two advantages: First, these approximations are well-established in the empirical literature.[58] Second, conducting in this way renders possible to look at the whole picture of portfolio composition.[59]

GSP, SPI and C are turned into per capita variables using population data by state and converted into 2000 prices using the consumer price index.

Data on inter- and intrastate deregulation is obtained from Demyanyk et al. (2007), Table 1. The intrastate deregulation dummy $D^a_{k,t}$ and interstate deregulation dummy $D^b_{k,t}$ are zero before deregulation and is one from the year in which deregulation took place in state k onwards.

I also construct a couple of specific dummies in order to distinguish all sorts of the effects of interstate and intrastate deregulations on different groups of states. $D^a_{k,t} - D^b_{k,t}$ is a dummy variable that switches on (from 0 to 1) the year of intrastate deregulation and switches off after interstate deregulation for the developed states. Thus, it measures the temporary effect of intrastate deregulation before interstate deregulation has been implemented. For the non-developed states in contrast, this dummy measures the effect of interstate deregulation before intrastate deregulation has taken place because the dummy becomes minus one after interstate deregulation and remains so up to intrastate deregulation.

$cs(D^a_{k,t} - D^b_{k,t})$ is a cumulative sum of $D^a_{k,t} - D^b_{k,t}$ dummy. For developed (non-developed) states, it becomes 1 (-1) from the year of intrastate (interstate) deregulation, afterwards it increases (decreases) yearly by 1 up to the year of interstate (intrastate) deregulation and then remains at this level till the end of the period. Thus, this dummy measures the cumulative

income flows and its gross state product is lower than state income, so that output/income ratio is smaller than one.

[58] See e.g. Atkeson and Bayoumi (1993), Asdrubali et al. (1996), Bertocchi and Canova (2002) and Kalemli-Ozcan et al. (2006).

[59] The decomposition is as follows: $1 = \left(\frac{\text{output}}{\text{income}}\right) \cdot \left(\frac{\text{income}}{\text{consumption}}\right) \cdot \left(\frac{\text{consumption}}{\text{output}}\right)$.

or permanent effect of banking deregulations.

Using regional data for the United States yields several benefits. First, the data for all states are consistent and reliable. Besides, the data range over more than 40 years and 50 states and offer sufficient scope for cross-sectional, time-series or panel analysis. Second, conducting research within US states sheds light on the impact of financial market globalization on the behavior across countries and the probable adjustment scenarios.

4.4.3 Graphical evidence

Figure 4.2A illustrates that blue (developed) states have higher income/output ratio after interstate banking deregulation, and for red (non-developed) states this ratio is rather higher before interstate deregulation. This result suggests that interstate banking deregulation entails higher net income flows in blue states and lower ones in red states. Thus, this result corroborates our expectations with regard to the MQRR model suggesting that more financially developed states have increased their equity holdings after interstate banking deregulation and less developed states have seen a decrease in equity holdings.

Mendoza et al. suggest that financial integration, in our case interstate deregulation, leads to higher savings in less financially developed states and to lower savings in more developed states. Our results, shown in the figure 4.2B, are not so clear in this respect. However, it is apparent that blue states have already had lower savings before interstate deregulation. This outcome may be explained by the fact that at the moment of interstate deregulation blue states have conducted intrastate deregulation and the risks within a state have been diminished so that precautionary savings had already fallen before interstate deregulation having been implemented. Admittedly, we should be careful in the attempt to reconcile the MQRR suggestion concerning savings development in the data. The model does not allow to distinguish between output and income, and thus it is not explicit about the definition of income. Moreover, our data do not provide a direct measure of savings and the data on consumption may contain a measurement error, so that conclusions should be drawn with caution.

The effect of interstate banking deregulation on consumption (here, consumption over output) is explored in figure 4.2C. Average increase in the consumption over output ratio is lower in less financially developed states on average, which is in line with the MQRR hypothesis. For more financially developed states, however, we can not see any significant change after interstate banking deregulation.

All three pictures exhibit another striking feature of the effect of interstate banking deregulation common for all of them: red states represent a very homogeneous group with respect to average income over output, income over consumption and consumption over output before interstate banking deregulation. For these states, all these three macroeconomic variables vary around zero. But after opening states for other banks, they become very heterogeneous. We see that red points always lie along the imaginary vertical line going through zero. In contrast, more developed, blue, states seem to become more homogeneous with interstate banking deregulation. This effect is in particular strongly pronounced for the income/consumption and consumption/output ratios.

Figures 4.3A-F and figure 4.4 provide more complete insights into the development of net income flows, savings and consumption for both groups of states. This development proceeded over three stages: before intrastate deregulation (only for blue states), before interstate deregulation (and after intrastate deregulation for blue states), after interstate deregulation and after intrastate deregulation (only for red states). Whereas figures 4.3A-F illustrate state by state annual average increase of the income/output, income/consumption and consumption/output ratios in every stage of development [60], in figure 4.4 the ratios from figures 4.3A-F are summed up to an average across developed or non-developed states. The averaging is carried out both without weights and by weighting with average gross state

[60] Annual average increase in X for every state in every development stage is calculated as follows: $\bar{X}^1_{blue} = \frac{X_{Intra} - X_1}{Intra}$, $\bar{X}^2_{blue} = \frac{X_{Inter} - X_{Intra}}{Inter - Intra} \bar{X}^3_{blue} = \frac{X_{End} - X_{Inter}}{End - Inter}$, and $\bar{X}^1_{red} = \frac{X_{Inter} - X_1}{Inter}$,$\bar{X}^2_{red} = \frac{X_{Intra} - X_{Inter}}{Intra - Inter}$, $\bar{X}^3_{red} = \frac{X_{End} - X_{Intra}}{End - Intra}$, where $[X = \frac{income}{output}, \frac{incomec}{consumption}, \frac{consumption}{output}]$.

product or average population for respective period of time[61].

Both figures reveal that in the majority of developed states the income/output and the consumption/output ratios increase after interstate banking deregulation, which corroborates the suggestions of the MQRR model. Though the income/consumption ratio, indicating savings, decrease after intrastate deregulation, which is in line with MQRR, it increases after interstate deregulation, which dissent from the theory. It is also apparent that in the developed states the income/output and the consumption/output ratios decrease after intrastate deregulation. Unfortunately, the models mentioned above are silent about the effects of intrastate deregulation on consumption and holdings of productive assets. Overall, average results for developed states seems to be robust to different weighting methods.

The effect of interstate deregulation on consumption, savings and net income flows in the non-developed states confirms the suggestions of the MQRR model: following financial integration, here interstate deregulation, less developed states decrease their holdings in risky assets, increase savings and decrease consumption. And again, we do not have any suggestions from the theory on the effects of intrastate deregulation. Moreover, figures 4.3A-F do not provide any evidence what states systematically differ from the majority.

4.4.4 Results from panel OLS regressions

In this section I examine whether the pattern of capital flows - before and after interstate banking deregulation - differs across states depending on their degree of financial development. To empirically explore this questions, I estimate following panel OLS regressions in levels

$$X_{k,t} - X_{k,Inter} = \alpha + \beta Y_{k,t} + \tau_t + \delta_k + \epsilon_{k,t},$$

[61] The weights are constructed as average weight over the years before intra, before inter, after inter and after intra respectively for each state. There is no red bar for developed states and dark blue bar for non-developed states because developed states do not pass through the development stage "after Intra" as a last stage and non-developed states do not pass through the development stage "before Intra" as a first stage.

where $X_{k,t} - X_{k,Inter}$ is state k's variable X at time t relative to the time of interstate banking deregulation with $X = NFI, S, C$. $NFI = \frac{income}{output}$, $S = \frac{income}{consumption}$, $C = \frac{consumption}{output}$. Depending on the parametrization our regressor $Y_{k,t}$ contains various dummies that capture different effects of interstate banking deregulation. We also control for time- and state-fixed effects.

The main results are presented in table 4.2. In the period between intra- and interstate deregulation, income over output and consumption over output increase in the developed states (row 1 and 5) by 3 percentage points. Moreover, every year after intrastate deregulation (and until interstate deregulation) increases these variables additionally by 0.05 percentage points (row 5). This is also true for the effect of interstate deregulation in the red states. These results are consistent with the evidence we obtained from the graphs analysis and with Mendoza et al. However, there is no temporary effect of interstate deregulation on income over consumption (savings, here) and the cumulative effect is falsely signed because we expect savings to fall in the blue states and to rise in the red states.

However, when included into regressions, both dummies, $D^a_{k,t} - D^b_{k,t}$ and $cs(D^a_{k,t} - D^b_{k,t})$, assume a symmetry of the effect of interstate deregulation on both groups of states. To control for a possible asymmetry I construct two different dummies for every group of states and then include them both into my previous regressions. $D^a_{Lk,t} - D^b_{Lk,t}$ is a dummy for liberalized states that becomes one from the year of intrastate banking deregulation and remains equal to one till the date of interstate banking deregulation. $D^a_{NLk,t} - D^b_{NLk,t}$ is zero before interstate banking deregulation and is minus one from the year in which interstate deregulation took place in non-developed states, it switches back to zero after intrastate deregulation. $cs(D^a_{Lk,t} - D^b_{Lk,t})$ and $cs(D^a_{NLk,t} - D^b_{NLk,t})$ are constructed analogously to $cs(D^a_{k,t} - D^b_{k,t})$. We see that only income over output and consumption over output in developed states are temporary affected (rows 2 and 6). Permanent effect of banking deregulation is significant for the whole pattern of capital flows across developed countries and for savings and consumption in non-developed ones (rows 4 and 6).

To control for group-fixed effect, i.e. for being either developed or non-developed state, we add a "liberalized" dummy D_L or "non-liberalized" dummy D_{NL}. The results are presented in table 4.3. Being red or blue state has significant impact on NFI and C in both groups (rows 1 and 2). When adding D_L and D_{NL} individually (rows 3 and 4), they appear correctly signed in all specifications, but only significant for NFI and C in non-developed states. and nearly always significant: having abolished restrictions on intrastate banking prior to interstate one induces higher NFI and C, and lower S. Moreover, results given in rows 5-8 provide an insight whether the importance of belonging to the certain group of states increases over time. For this purpose I include one of the trended dummies ($D_{NL} * t$ or $D_L * t$). Being developed or non-developed state becomes more important over time for the effect of banking deregulation on NFI and C.

Table 4.4 examines whether being a developed or a non-developed state had long lasting or just temporary effects on capital flows following the regulatory change in both groups of states. I differentiate between permanent effect (PE) and temporary effect (TE) dummies for each group of states. Permanent effect dummy becomes one starting in the year of interstate banking deregulation and remains one up to the end of the period. Row 1 suggests that only permanent effect of interstate deregulation on savings in more developed states is statistically significant: being a developed state decreases average savings rate by 0.015-0.017 in the long run. Moreover, this effect remains significant with the same order of magnitude throughout all specifications. Temporary effect dummy is constructed for either one, three or five years. It becomes one starting in the year of interstate deregulation and remains equal to one for one, three or five years respectively, $TE1$, $TE3$, $TE5$. It is obvious that temporary effects are never significant in these specifications. The permanent effect on interstate deregulation on net income flows is never significant in the first four rows of table 4.4. However, if I control for industrial structure, i.e. for oil or agricultural states, or for the initial level of output in a state, permanent effect becomes highly significant and correctly signed (rows 5 and 7). This result may be explained by the differences in industries' access to capital markets: e.g. oil industries are usually listed on stock exchange, so that states, that are rich on oil and oil-producing enterprises, would most likely have very high output over income (or very low income over output) ratios compared to the average US state.

4.5 Conclusion

We study the pattern of capital income flows across US states. Recent literature on global imbalances has emphasized the particular role of interaction between domestic financial development and financial integration for the occurrence of international financial imbalances. So far, the models trying to explain global imbalances have been applied only to international capital flows between emerging and industrial countries. The model of Mendoza et al. (2009) suggests that whereas in more developed countries holdings of risky assets and consumption increase and savings decrease after financial integration, less financially developed countries experience a fall in consumption and holdings of productive assets and rise in the savings rate. In this chapter, we have verified the predictions of this model at intranational level using the data for US states. We use the state-level ratio of personal income to output and personal income to consumption as measures for net capital inflows and savings, respectively. We then examined the implications of interstate banking deregulation on differently financially developed US states, where the stage of financial development depended on the implementation of intrastate deregulation prior to interstate deregulation. We find strong support for the model predictions in the data, so that we can conclude that implications of financial integration for heterogeneous financial markets seem to be alike at international and intranational level.

Thus, our evidence shows that studying intranational dimension of imbalances may be very useful in providing further insights into the development of current global imbalances, their duration and their impact on growth, volatility and other important macroeconomic variables.

Appendix

Table 4.1A: US inter- and intrastate banking deregulations by state.

Developed	Intra	Inter	Non-Developed	Intra	Inter
Alaska	1963	1982	Massachusetts	1984	1983
Arizona	1963	1986	Kentucky	1990	1984
California	1963	1987	Florida	1988	1985
Delaware	1963	1988	Illinois	1988	1986
District of Columbia	1963	1985	Indiana	1989	1986
Idaho	1963	1985	Michigan	1987	1986
Maryland	1963	1985	Minnesota	1993	1986
Nevada	1963	1985	Missouri	1990	1986
North Carolina	1963	1985	Louisiana	1988	1987
Rhode Island	1963	1984	Oklahoma	1988	1987
South Carolina	1963	1986	Texas	1988	1987
South Dakota	1963	1988	Wisconsin	1990	1987
Vermont	1970	1988	Wyoming	1988	1987
Maine	1975	1978	Colorado	1991	1988
New York	1976	1982	Arkansas	1994	1989
New Jersey	1977	1986	New Mexico	1991	1989
Virginia	1978	1985	Iowa	1997	1991
Ohio	1979	1985			
Connecticut	1980	1986	**Intra=Inter**		
Alabama	1981	1987	New Hampshire	1987	1987
Utah	1981	1984	Tennessee	1985	1985
Pennsylvania	1982	1986			
Georgia	1983	1985			
Nebraska	1985	1990			
Oregon	1985	1986			
Washington	1985	1987			
Hawaii	1986	1995			
Mississippi	1986	1988			
Kansas	1987	1992			
North Dakota	1987	1991			
West Virginia	1987	1988			
Montana	1990	1993			

Table 4.1B: US inter- and intrastate banking deregulations by state.

state	Intrastate deregulation	state	Interstate deregulation
Alaska	1963	Maine	1978
Arizona	1963	Alaska	1982
California	1963	New York	1982
Delaware	1963	Connecticut	1983
District of Columbia	1963	Massachusetts	1983
Idaho	1963	Kentucky	1984
Maryland	1963	Rhode Island	1984
Nevada	1963	Utah	1984
North Carolina	1963	District of Columbia	1985
Rhode Island	1963	Florida	1985
South Carolina	1963	Georgia	1985
South Dakota	1963	Idaho	1985
Vermont	1970	Maryland	1985
Maine	1975	Nevada	1985
New York	1976	North Carolina	1985
New Jersey	1977	Ohio	1985
Virginia	1978	Tennessee	1985
Ohio	1979	Virginia	1985
Connecticut	1980	Arizona	1986
Alabama	1981	Illinois	1986
Utah	1981	Indiana	1986
Pennsylvania	1982	Michigan	1986
Georgia	1983	Minnesota	1986
Massachusetts	1984	Missouri	1986
Nebraska	1985	New Jersey	1986
Oregon	1985	Oregon	1986
Tennessee	1985	Pennsylvania	1986
Washington	1985	South Carolina	1986
Hawaii	1986	Alabama	1987
Mississippi	1986	California	1987
Kansas	1987	Louisiana	1987
Michigan	1987	New Hampshire	1987
New Hampshire	1987	Oklahoma	1987
North Dakota	1987	Texas	1987
West Virginia	1987	Washington	1987
Florida	1988	Wisconsin	1987
Illinois	1988	Wyoming	1987
Louisiana	1988	Colorado	1988
Oklahoma	1988	Delaware	1988
Texas	1988	Mississippi	1988
Wyoming	1988	South Dakota	1988
Indiana	1989	Vermont	1988
Kentucky	1990	West Virginia	1988
Missouri	1990	Arkansas	1989
Montana	1990	New Mexico	1989
Wisconsin	1990	Nebraska	1990
Colorado	1991	Iowa	1991
New Mexico	1991	North Dakota	1991
Minnesota	1993	Kansas	1992
Arkansas	1994	Montana	1993
Iowa	1997	Hawaii	1995

Table 4.1C: US inter- and intrastate banking deregulations: Descriptive statistics.

		Min	Max	Mean	Median	Std
Developed	Intrastate	1963	1990	1975	1978	10.15
	Interstate	1978	1995	1986	1986	3.34
Non-developed	Intrastate	1984	1997	1990	1989	3.00
	Interstate	1983	1991	1987	1987	1.90

Table 4.2: Effects of interstate banking deregulation

Table reports results of the OLS regressions, where regressors are given in the left column. Regressand is $X_{k,t} - X_{k,Inter}$, where X is NFI, S and C respectively. $NFI = \frac{income}{output}$, $S = \frac{income}{consumption}$, $C = \frac{consumption}{output}$. cs is cumulative sum. D_X is a dummy for being X state, with $X = [L, NL] = [Liberalized, Non - Liberalized]$. $D^a_{k,t}$ is a dummy for intrastate deregulation, $D^b_{k,t}$ is a dummy for interstate deregulation. t is trend. T-statistics are in parenthesis.

		NFI		S		C	
(1)	1	-0.0073	(-5.2161)	0.0059	(2.3479)	-0.0130	(-6.4051)
	$D^a_{k,t} - D^b_{k,t}$	0.0366	(11.4496)	0.0005	(0.0788)	0.0359	(7.7389)
(2)	1	-0.0096	(-6.5509)	0.0068	(2.5455)	-0.0159	(-7.5234)
	$D^a_{Lk,t} - D^b_{Lk,t}$	0.0443	(12.6122)	-0.0023	(-0.3610)	0.0459	(8.9974)
	$D^a_{NLk,t} - D^b_{NLk,t}$	-0.0056	(-0.6397)	0.0157	(0.9782)	-0.0191	(-1.4923)
(3)	1	-0.0063	(-4.0923)	0.0017	(0.6335)	-0.0126	(-5.6793)
	$cs(D^a_{k,t} - D^b_{k,t})$	0.0009	(5.7622)	0.0009	(3.2023)	0.0010	(4.4330)
(4)	1	-0.0064	(-3.7375)	0.0057	(1.8863)	-0.0155	(-6.2904)
	$cs(D^a_{Lk,t} - D^b_{Lk,t})$	0.0010	(5.4545)	0.0006	(1.9693)	0.0013	(5.0996)
	$cs(D^a_{NLk,t} - D^b_{NLk,t})$	0.0008	(0.6500)	0.0070	(3.3875)	-0.0034	(-2.0383)
(5)	1	-0.0088	(-5.7787)	0.0022	(0.7805)	-0.0150	(-6.7470)
	$D^a_{k,t} - D^b_{k,t}$	0.0341	(10.1387)	-0.0058	(-0.9560)	0.0326	(6.6905)
	$cs(D^a_{k,t} - D^b_{k,t})$	0.0004	(2.4774)	0.0010	(3.3409)	0.0005	(2.1935)
(6)	1	-0.0115	(-6.6466)	0.0068	(2.1689)	-0.0209	(-8.2857)
	$D^a_{Lk,t} - D^b_{Lk,t}$	0.0418	(11.4305)	-0.0095	(-1.4357)	0.0434	(8.1678)
	$D^a_{NLk,t} - D^b_{NLk,t}$	-0.0069	(-0.7516)	-0.0036	(-0.2170)	-0.0128	(-0.9635)
	$cs(D^a_{Lk,t} - D^b_{Lk,t})$	0.0005	(2.5759)	0.0007	(2.2745)	0.0008	(2.9826)
	$cs(D^a_{NLk,t} - D^b_{NLk,t})$	-0.0003	(-0.2375)	0.0074	(3.4400)	-0.0043	(-2.4924)

Table 4.3: Effects of interstate banking deregulation, group-fixed effects

Table reports results of the OLS regressions, where regressors are given in the left column. Regressand is $X_{k,t} - X_{k,Inter}$, where X is NFI, S and C respectively. $NFI = \frac{income}{output}$, $S = \frac{income}{consumption}$, $C = \frac{consumption}{output}$. cs is cumulative sum. D_X is a dummy for being X state, with $X = [L, NL] = [Liberalized, Non-Liberalized]$. $D^a_{k,t}$ is a dummy for intrastate deregulation, $D^b_{k,t}$ is a dummy for interstate deregulation. t is trend. T-statistics are in parenthesis.

		NFI		S		C	
(1)	1	-0.0129	(-5.8655)	0.0045	(1.1467)	-0.0207	(-6.5415)
	D_L	0.0175	(6.2790)	0.0024	(0.4924)	0.0205	(5.1522)
(2)	1	0.0051	(3.1162)	0.0071	(2.4128)	0.0001	(0.0599)
	D_{NL}	-0.0212	(-7.4712)	-0.0031	(-0.6183)	-0.0237	(-5.8138)
(3)	1	-0.0106	(-4.8599)	0.0056	(1.4138)	-0.0184	(-5.8403)
	$D^a_{k,t} - D^b_{k,t}$	0.0330	(9.4386)	-0.0037	(-0.5837)	0.0305	(6.0098)
	$cs(D^a_{k,t} - D^b_{k,t})$	0.0003	(1.6585)	0.0012	(3.5203)	0.0003	(1.2109)
	D_L	0.0037	(1.1169)	-0.0074	(-1.2168)	0.0075	(1.5361)
(4)	1	-0.0042	(-1.8925)	-0.0005	(-0.1305)	-0.0090	(-2.7941)
	$D^a_{k,t} - D^b_{k,t}$	0.0315	(9.0725)	-0.0043	(-0.6871)	0.0293	(5.8173)
	$cs(D^a_{k,t} - D^b_{k,t})$	0.0002	(0.9814)	0.0012	(3.4056)	0.0002	(0.8675)
	D_{NL}	-0.0095	(-2.8631)	0.0055	(0.9165)	-0.0123	(-2.5363)
(5)	1	-0.0048	(-2.5827)	0.0039	(1.1966)	-0.0123	(-4.5914)
	$D_L * t$	0.0002	(2.2224)	0.0001	(0.9076)	0.0003	(2.4452)
(6)	1	0.0005	(0.3105)	0.0070	(2.5268)	-0.0037	(-1.6431)
	$D_{NL} * t$	-0.0003	(-3.1120)	-0.0001	(-0.6969)	-0.0006	(-3.6406)
(7)	1	-0.0088	(-4.6769)	0.0053	(1.5759)	-0.0161	(-5.9351)
	$D^a_{k,t} - D^b_{k,t}$	0.0340	(9.9662)	-0.0076	(-1.2261)	0.0332	(6.7137)
	$cs(D^a_{k,t} - D^b_{k,t})$	0.0004	(1.9484)	0.0014	(3.6058)	0.0004	(1.2101)
	$D_L * t$	-0.0000	(-0.0834)	-0.0004	(-1.6290)	0.0001	(0.7260)
(8)	1	-0.0110	(-5.4434)	0.0005	(0.1420)	-0.0142	(-4.8231)
	$D^a_{k,t} - D^b_{k,t}$	0.0353	(10.2601)	-0.0049	(-0.7887)	0.0322	(6.4476)
	$cs(D^a_{k,t} - D^b_{k,t})$	0.0005	(2.9291)	0.0011	(3.3346)	0.0005	(1.8445)
	$D_{NL} * t$	0.0002	(1.6442)	0.0001	(0.6824)	-0.0001	(-0.4137)

Table 4.4: Permanent and temporary effects of interstate banking deregulation

Table reports results of the OLS Regressions, where regressors are given in the left column. Regressand is $X_{k,t} - X_{k,Inter}$, where X is NFI, S and C respectively. $NFI = \frac{income}{output}$, $S = \frac{income}{consumption}$, $C = \frac{consumption}{output}$. cs is cumulative sum. PE_X is a permanent effect of being X state after interstate deregulation up to the end of the period and $TE1_X/TE3_X/TE5_X$ are temporary effects of being X state after interstate deregulation for 1/3/5 years respectively, with $X = [L, NL] = [Liberalized, Non-Liberalized]$. T-statistics are in parenthesis.

		NFI		S		C	
(1)	1	-0.0022	(-1.1779)	0.0076	(2.3555)	-0.0075	(-2.8589)
	PE_L	0.0017	(0.4524)	-0.0165	(-2.5317)	-0.0057	(-1.0881)
	PE_{NL}	-0.0009	(-0.2507)	0.0095	(1.5186)	0.0039	(0.7674)
(2)	1	-0.0022	(-1.1865)	0.0077	(2.3816)	-0.0075	(-2.8682)
	PE_L	0.0018	(0.4818)	-0.0172	(-2.6048)	-0.0055	(-1.0359)
	$TE1_L$	0.0020	(0.1762)	-0.0064	(-0.3267)	0.0073	(0.4596)
	PE_{NL}	-0.0011	(-0.2985)	0.0104	(1.6292)	0.0035	(0.6720)
	$TE1_{NL}$	0.0029	(0.1967)	-0.0163	(-0.6206)	0.0036	(0.1705)
(3)	1	-0.0021	(-1.1709)	0.0077	(2.3956)	-0.0075	(-2.8588)
	PE_L	0.0016	(0.4306)	-0.0173	(-2.6150)	-0.0058	(-1.0748)
	$TE3_L$	-0.0001	(-0.0132)	-0.0074	(-0.6334)	0.0053	(0.5599)
	PE_{NL}	-0.0008	(-0.2188)	0.0111	(1.7009)	0.0035	(0.6580)
	$TE3_{NL}$	-0.0007	(-0.0823)	-0.0088	(-0.5718)	-0.0019	(-0.1550)
(4)	1	-0.0021	(-1.1492)	0.0078	(2.4063)	-0.0075	(-2.8602)
	PE_L	0.0014	(0.3828)	-0.0172	(-2.6154)	-0.0058	(-1.0854)
	$TE5_L$	0.0000	(0.0062)	-0.0105	(-1.1180)	0.0075	(0.9918)
	PE_{NL}	-0.0005	(-0.1220)	0.0119	(1.7960)	0.0031	(0.5731)
	$TE5_{NL}$	-0.0035	(-0.5125)	-0.0046	(-0.3820)	-0.0048	(-0.4870)
(5)	1	-0.0037	(-2.0601)	-0.0012	(-0.3485)	-0.0021	(-0.8092)
	PE_L	0.0142	(3.9596)	-0.0235	(-3.5517)	0.0118	(2.2707)
	$PE_L * D_{oil}$	-0.1830	(-14.0438)	0.1237	(5.1501)	-0.2691	(-14.2729)
	PE_{NL}	-0.0165	(-4.7826)	0.0183	(2.8835)	-0.0166	(-3.3214)
	$PE_{NL} * D_{oil}$	0.2006	(16.1977)	-0.1349	(-5.9118)	0.2839	(15.8432)
	D_{oil}	0.0051	(0.9603)	0.0817	(8.3603)	-0.0593	(-7.7269)
(6)	1	0.0035	(1.7712)	0.0106	(3.0329)	-0.0038	(-1.3488)
	PE_L	-0.0019	(-0.4777)	-0.0302	(-4.3065)	0.0031	(0.5517)
	$PE_L * D_{agr}$	0.0204	(2.0208)	0.0730	(4.1344)	-0.0464	(-3.2321)
	PE_{NL}	-0.0026	(-0.6817)	0.0249	(3.6831)	-0.0124	(-2.2548)
	$PE_{NL} * D_{agr}$	0.0093	(0.9882)	-0.0943	(-5.7232)	0.0979	(7.3090)
	D_{agr}	-0.0327	(-6.8323)	-0.0169	(-2.0088)	-0.0214	(-3.1334)
(5)	1	-0.1052	(-11.7403)	-0.0358	(-2.3611)	-0.0579	(-4.4416)
	PE_L	0.0638	(3.5308)	0.2388	(7.8075)	0.0091	(0.3467)
	$PE_L * GSP_{63}$	-0.4195	(-3.3757)	-1.6967	(-8.0621)	-0.1355	(-0.7499)
	PE_{NL}	0.0457	(2.9176)	-0.3376	(-12.7165)	0.1472	(6.4576)
	$PE_{NL} * GSP_{63}$	-0.3533	(-3.3421)	2.3420	(13.0828)	-0.9880	(-6.4277)
	GSP_{63}	0.7304	(11.7040)	0.2950	(2.7915)	0.3607	(3.9745)

Deregulation of restrictions on intrastate branching

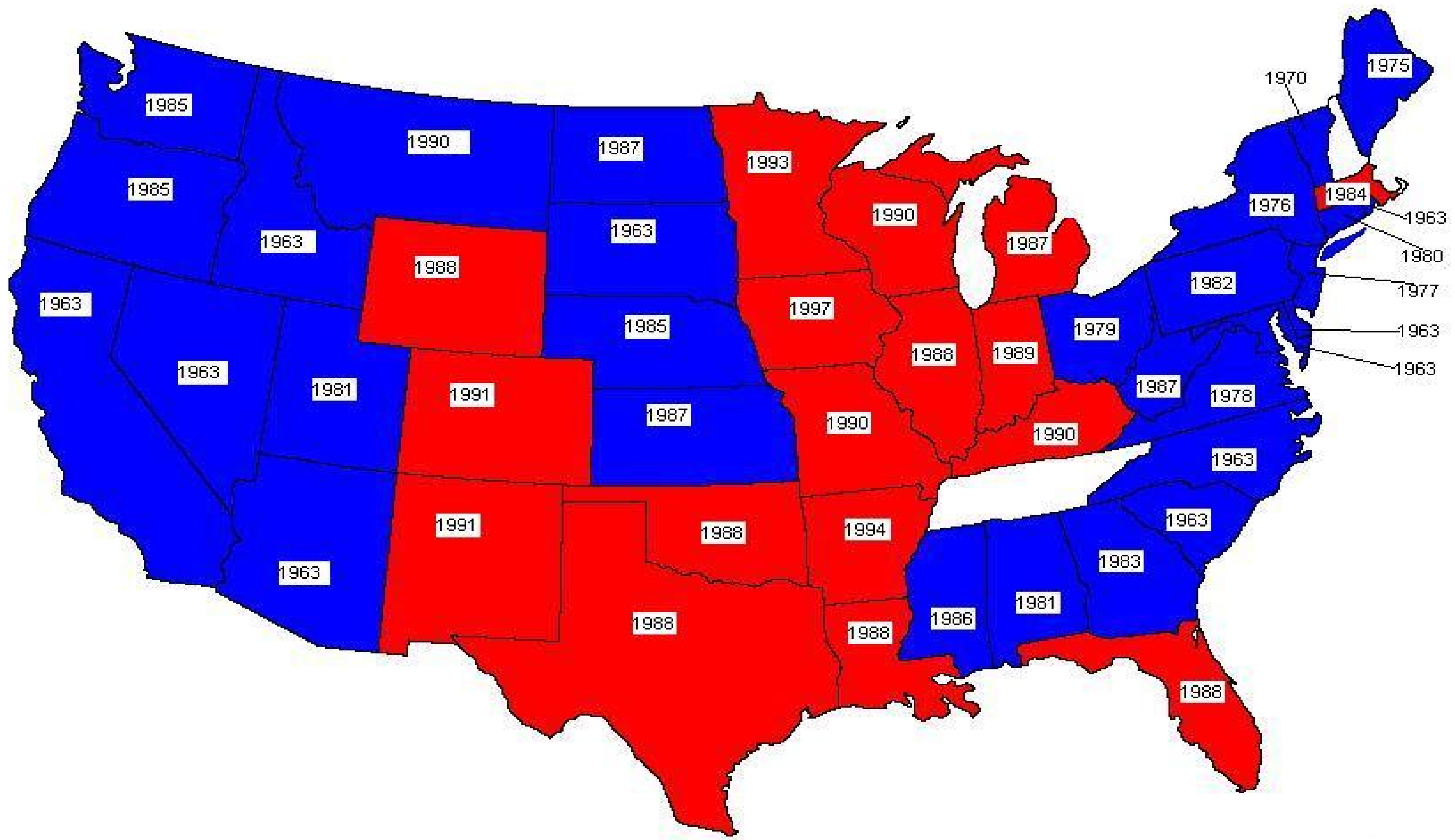

FIGURE 4.1: Blue states are the states that have implemented intrastate deregulation prior to interstate deregulation. Red states are the states that have implemented intrastate deregulation after interstate deregulation. New Hampshire and Tennessee are not coloured because intrastate and interstate deregulations were implemented there simultaneously.

Annual average increase in the income/output ratio before and after interstate banking deregulation

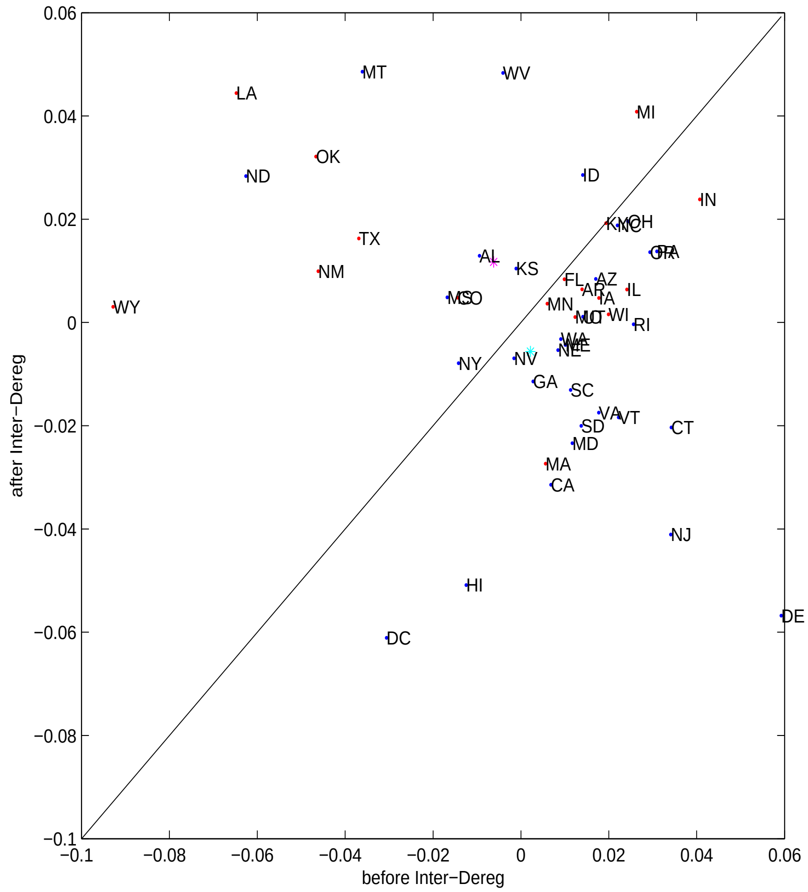

FIGURE 4.2A: This figure displays average increase in X per year for every state before and after interstate banking deregulation, where $[X = \frac{income}{output}]$. Average increase in X is calculated as $\bar{X}^b_{blue} = \frac{X_{Inter} - X_{Intra}}{Inter - Intra}$, $\bar{X}^a_{blue} = \frac{X_{End} - X_{Inter}}{End - Inter}$, $\bar{X}^b_{red} = \frac{X_{Inter} - X_1}{Inter}$, $\bar{X}^a_{red} = \frac{X_{Intra} - X_{Inter}}{Intra - Inter}$, where superscripts b and a denote an increase *before* and *after* interstate deregulation. Subscript *red* stands for non-developed red states and *blue* for developed blue ones. A cyan star represents an average increase of X over the *blue* states. A magenta star represents an average increase of X over the *red* states.

Annual average increase in the income/consumption ratio before and after interstate banking deregulation

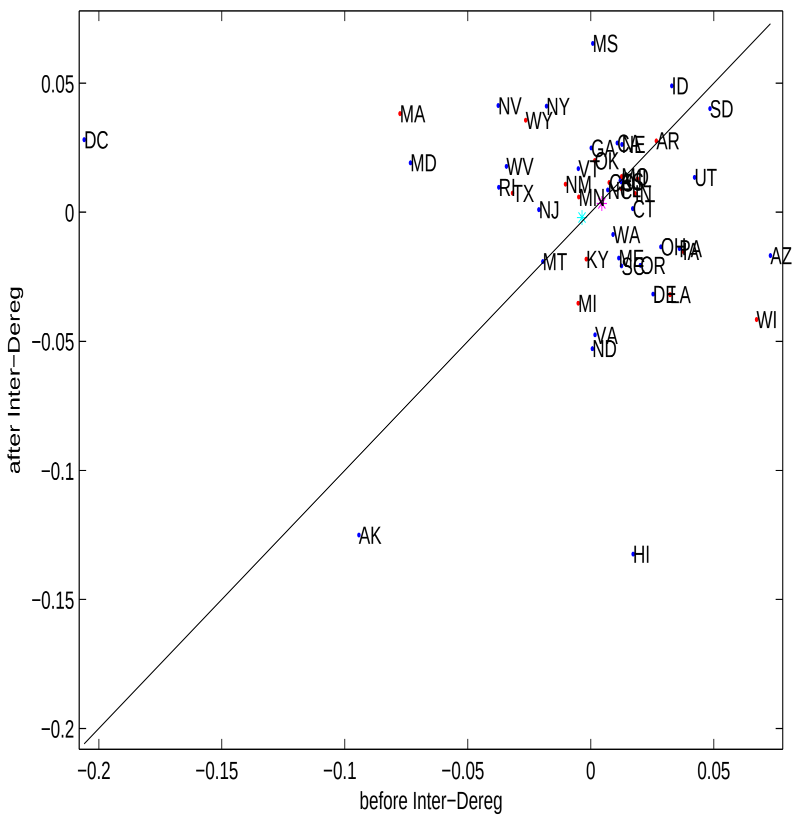

FIGURE 4.2B: This figure displays average increase in X per year for every state before and after interstate banking deregulation, where $[X = \frac{income}{consumption}]$. Average increase in X is calculated as $\bar{X}^b_{blue} = \frac{X_{Inter} - X_{Intra}}{Inter - Intra}$, $\bar{X}^a_{blue} = \frac{X_{End} - X_{Inter}}{End - Inter}$, $\bar{X}^b_{red} = \frac{X_{Inter} - X_1}{Inter}$, $\bar{X}^a_{red} = \frac{X_{Intra} - X_{Inter}}{Intra - Inter}$, where superscripts b and a denote an increase *before* and *after* interstate deregulation. Subscript *red* stands for non-developed red states and *blue* for developed blue ones. A cyan star represents an average increase of X over the *blue* states. A magenta star represents an average increase of X over the *red* states.

Annual average increase in the consumption/output ratio before and after interstate banking deregulation

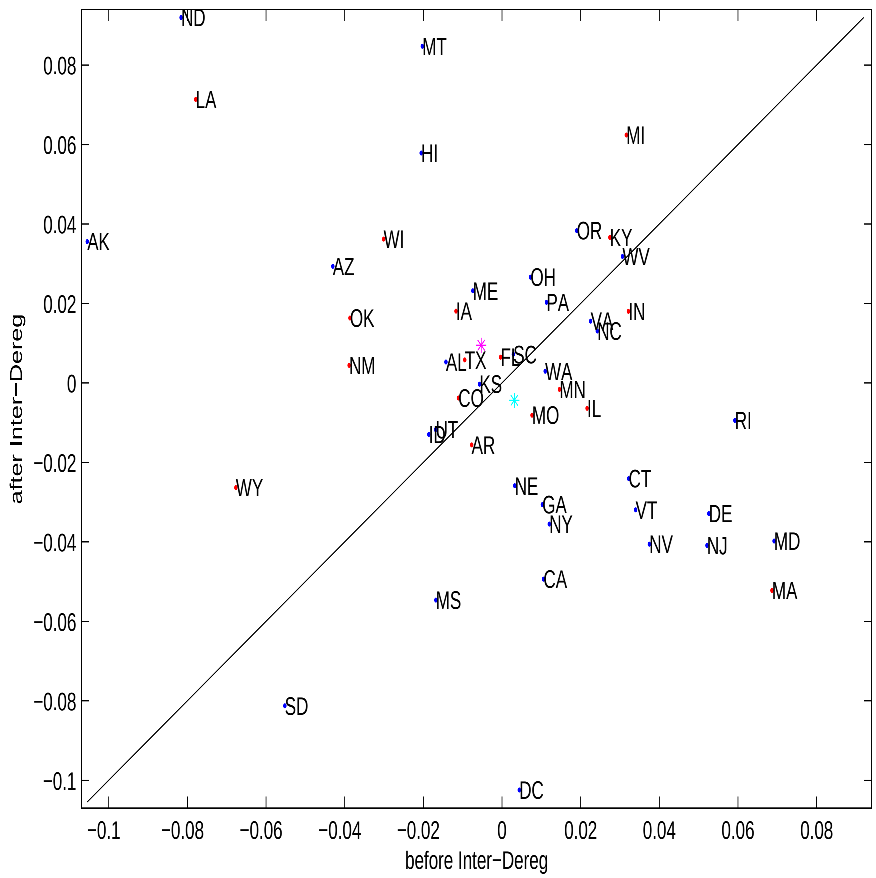

FIGURE 4.2C: This figure displays average increase in X per year for every state before and after interstate banking deregulation, where $[X = \frac{consumption}{output}]$. Average increase in X is calculated as $\bar{X}^b_{blue} = \frac{X_{Inter} - X_{Intra}}{Inter - Intra}$, $\bar{X}^a_{blue} = \frac{X_{End} - X_{Inter}}{End - Inter}$, $\bar{X}^b_{red} = \frac{X_{Inter} - X_1}{Inter}$, $\bar{X}^a_{red} = \frac{X_{Intra} - X_{Inter}}{Intra - Inter}$, where superscripts b and a denote an increase *before* and *after* interstate deregulation. Subscript *red* stands for non-developed red states and *blue* for developed blue ones. A cyan star represents an average increase of X over the *blue* states. A magenta star represents an average increase of X over the *red* states.

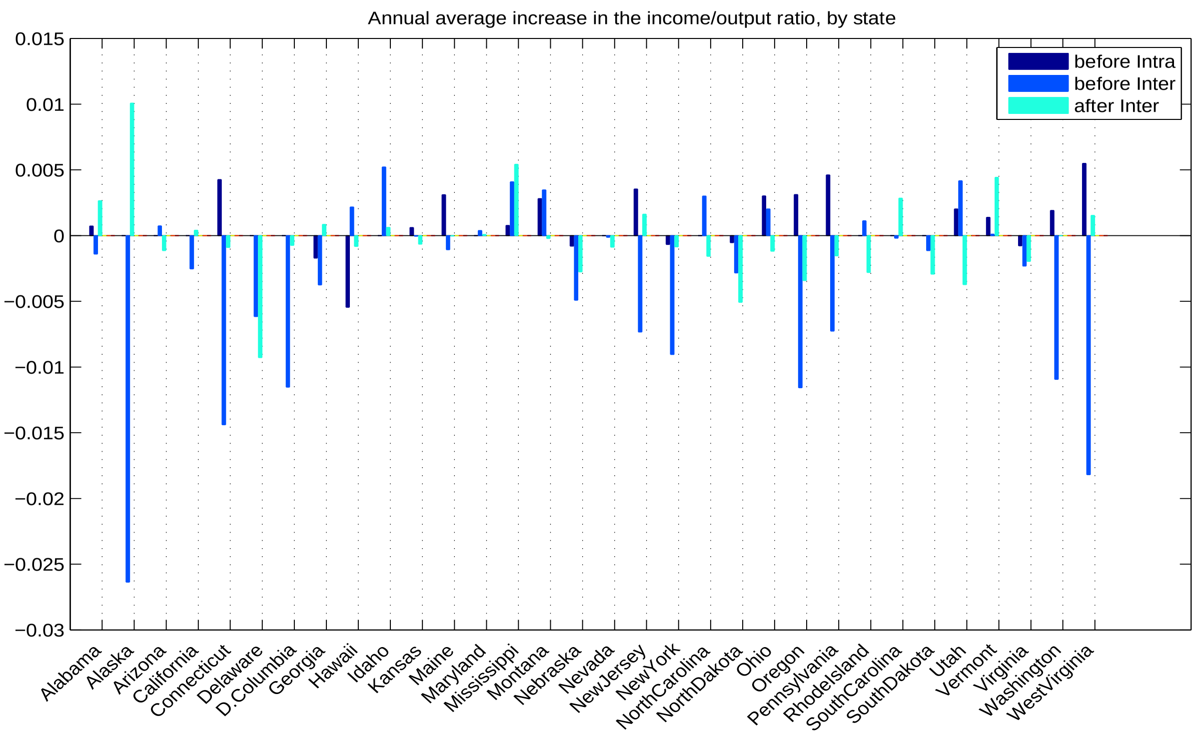

FIGURE 4.3A: This figure displays annual average increase in X for every developed state in every development stage calculated as follows: $\bar{X}^1_{blue} = \frac{X_{Intra}-X_1}{Intra}$, $\bar{X}^2_{blue} = \frac{X_{Inter}-X_{Intra}}{Inter-Intra}\,\bar{X}^3_{blue} = \frac{X_{End}-X_{Inter}}{End-Inter}$, where $[X = \frac{income}{output}]$. Superscripts $1, 2, 3$ stand for the respective stage of development: before intrastate deregulation, before interstate deregulation and after interstate deregulation.

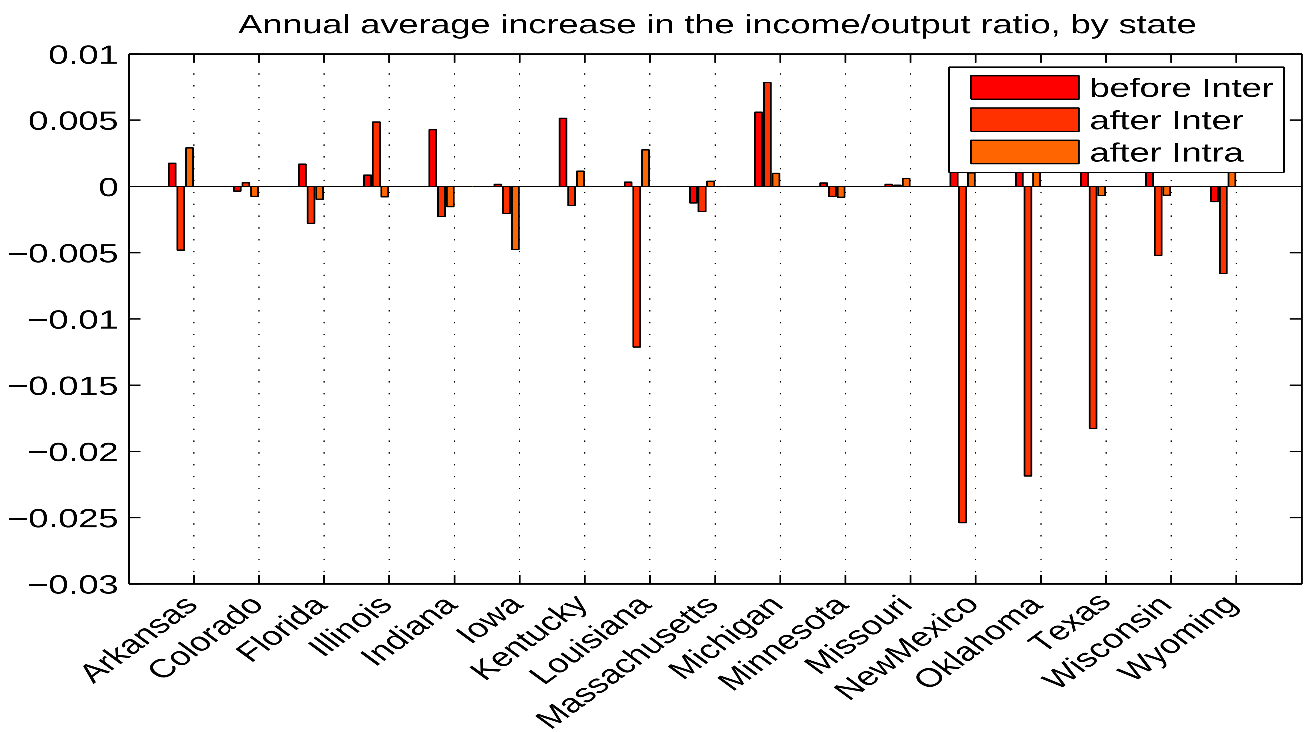

FIGURE 4.3B: This figure displays annual average increase in X for every non-developed state in every development stage calculated as follows: $\bar{X}^2_{red} = \frac{X_{Inter}-X_1}{Inter}$,$\bar{X}^3_{red} = \frac{X_{Intra}-X_{Inter}}{Intra-Inter}$, $\bar{X}^4_{red} = \frac{X_{End}-X_{Intra}}{End-Intra}$, where $[X = \frac{income}{output}]$. Superscripts $2, 3, 4$ stand for the respective stage of development: before interstate deregulation, after interstate deregulation and after intrastate deregulation.

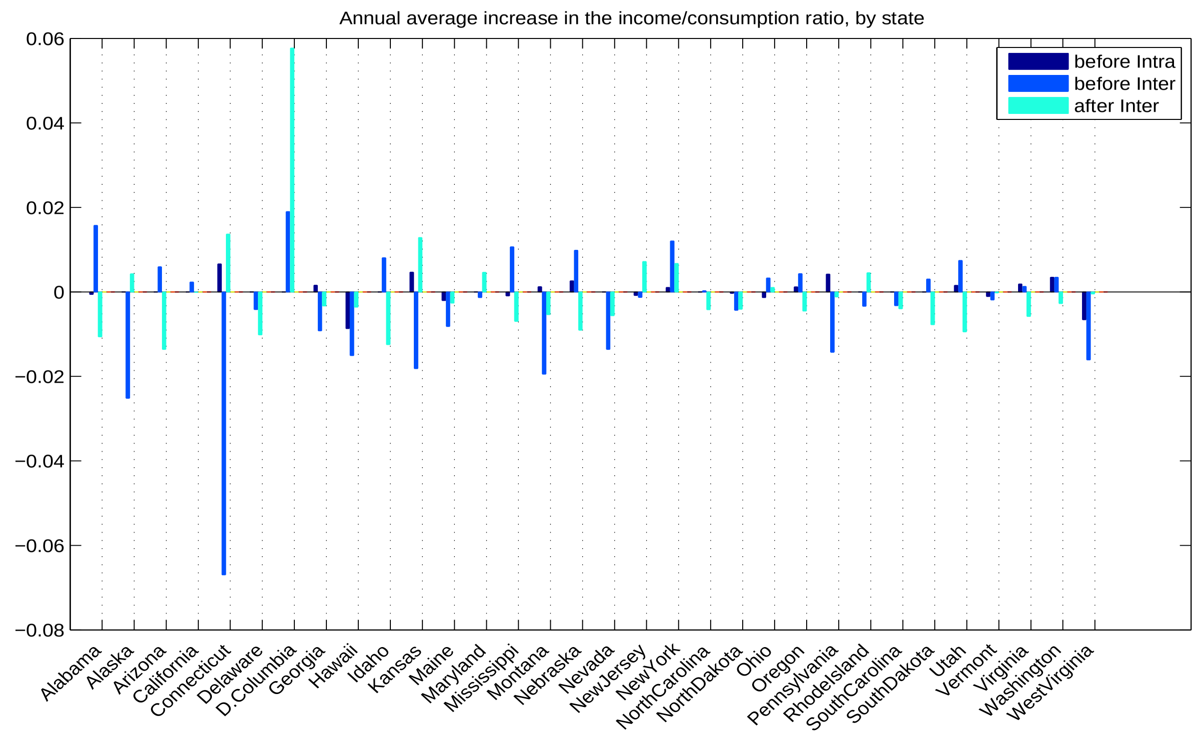

FIGURE 4.3C: This figure displays annual average increase in X for every developed state in every development stage calculated as follows: $\bar{X}^1_{blue} = \frac{X_{Intra}-X_1}{Intra}$, $\bar{X}^2_{blue} = \frac{X_{Inter}-X_{Intra}}{Inter-Intra}\bar{X}^3_{blue} = \frac{X_{End}-X_{Inter}}{End-Inter}$, where $[X = \frac{income}{consumption}]$. Superscripts $1, 2, 3$ stand for the respective stage of development: before intrastate deregulation, before interstate deregulation and after interstate deregulation.

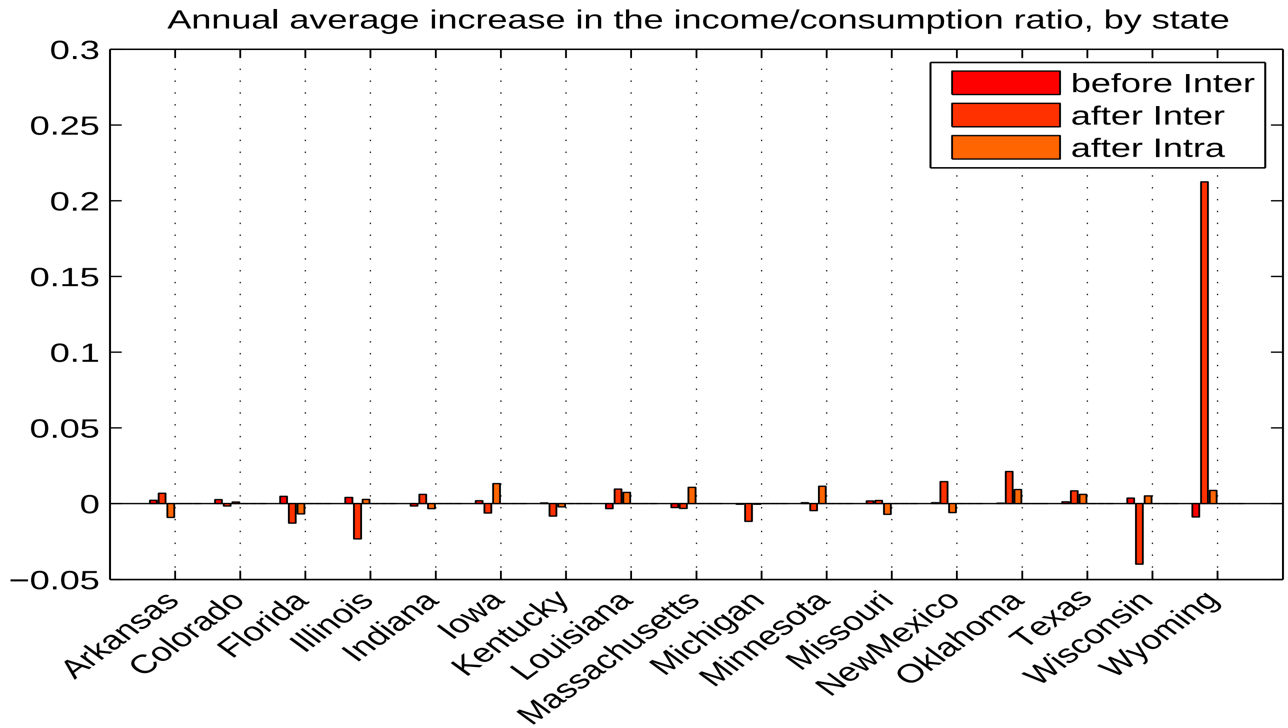

FIGURE 4.3D: This figure displays annual average increase in X for every non-developed state in every development stage calculated as follows: $\bar{X}^2_{red} = \frac{X_{Inter}-X_1}{Inter}$,$\bar{X}^3_{red} = \frac{X_{Intra}-X_{Inter}}{Intra-Inter}$, $\bar{X}^4_{red} = \frac{X_{End}-X_{Intra}}{End-Intra}$, where $[X = \frac{income}{consumption}]$. Superscripts 2, 3, 4 stand for the respective stage of development: before interstate deregulation, after interstate deregulation and after intrastate deregulation.

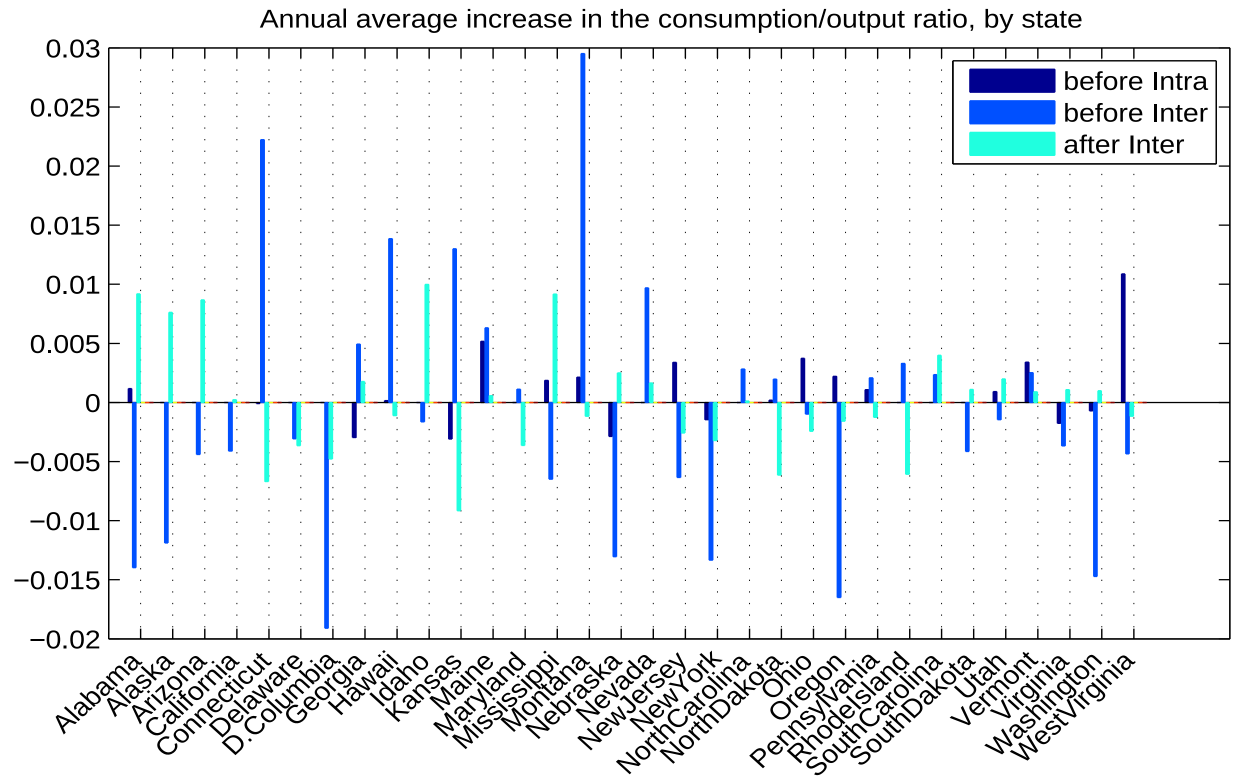

FIGURE 4.3E: This figure displays annual average increase in X for every state in every development stage calculated as follows: $\bar{X}^1_{blue} = \frac{X_{Intra}-X_1}{Intra}$, $\bar{X}^2_{blue} = \frac{X_{Inter}-X_{Intra}}{Inter-Intra}\bar{X}^3_{blue} = \frac{X_{End}-X_{Inter}}{End-Inter}$, where $[X = \frac{consumption}{output}]$. Superscripts $1, 2, 3$ stand for the respective stage of development: before intrastate deregulation, before interstate deregulation and after interstate deregulation.

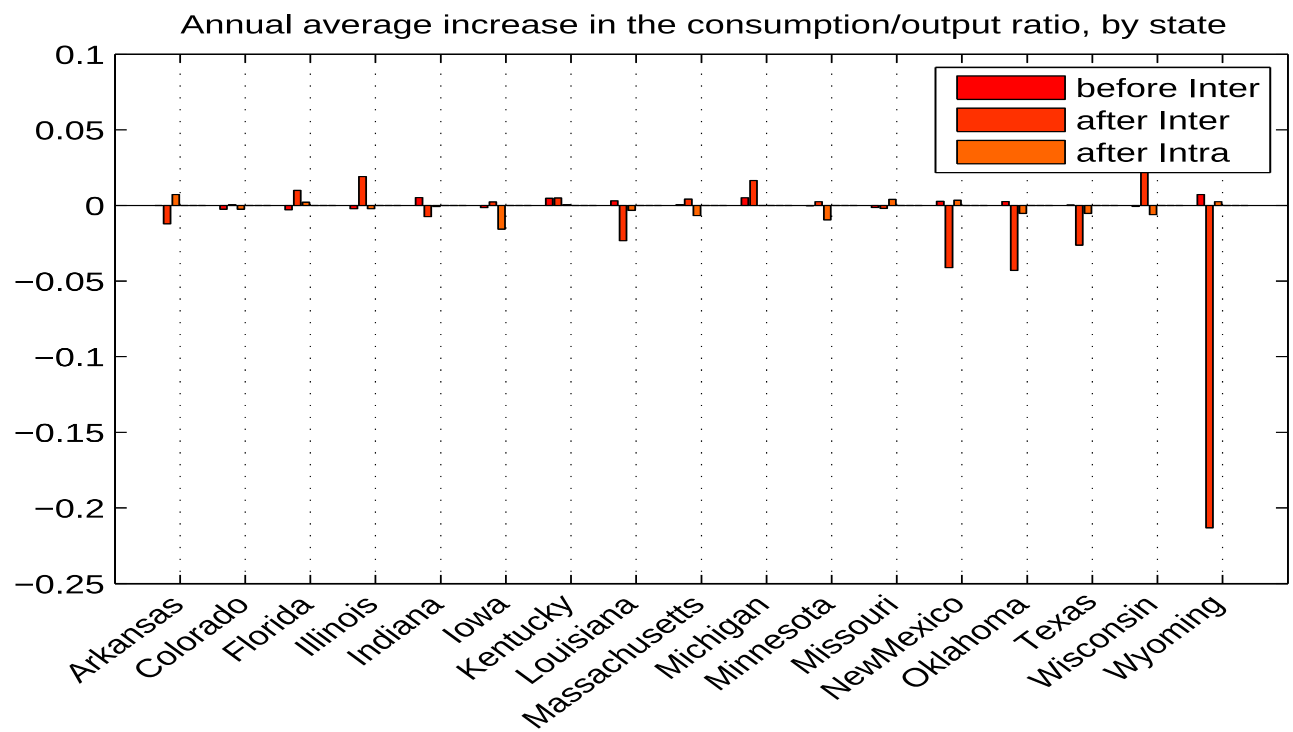

FIGURE 4.3F: This figure displays annual average increase in X for every non-developed state in every development stage calculated as follows: $\bar{X}^2_{red} = \frac{X_{Inter}-X_1}{Inter}$,$\bar{X}^3_{red} = \frac{X_{Intra}-X_{Inter}}{Intra-Inter}$, $\bar{X}^4_{red} = \frac{X_{End}-X_{Intra}}{End-Intra}$, where $[X = \frac{consumption}{output}]$. Superscripts $2, 3, 4$ stand for the respective stage of development: before interstate deregulation, after interstate deregulation and after intrastate deregulation.

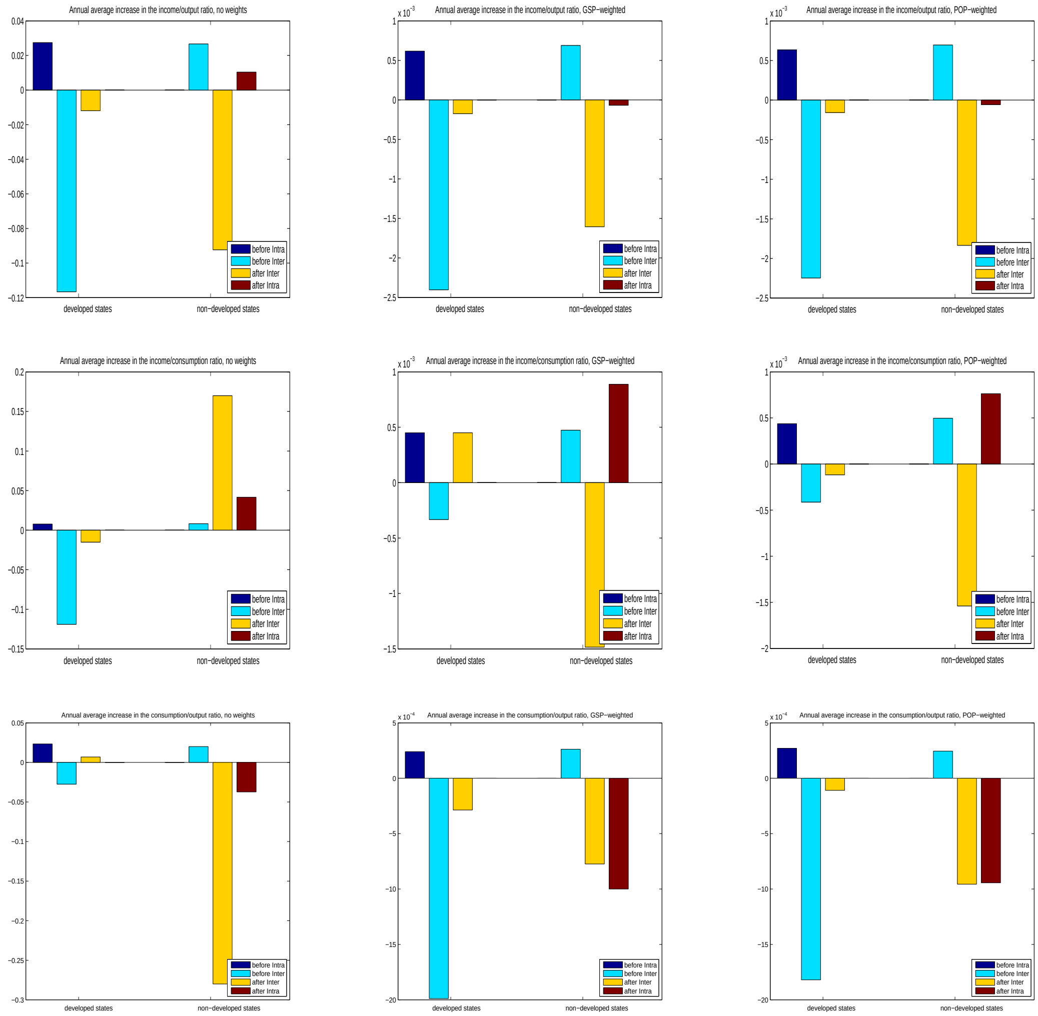

FIGURE 4.4: These figures display annual average increase in X averaged over all state in every development stage calculated as follows: $\bar{X}^1_{blue} = \frac{X_{Intra}-X_1}{Intra}$, $\bar{X}^2_{blue} = \frac{X_{Inter}-X_{Intra}}{Inter-Intra}$ $\bar{X}^3_{blue} = \frac{X_{End}-X_{Inter}}{End-Inter}$, and $\bar{X}^2_{red} = \frac{X_{Inter}-X_1}{Inter}$,$\bar{X}^3_{red} = \frac{X_{Intra}-X_{Inter}}{Intra-Inter}$, $\bar{X}^4_{red} = \frac{X_{End}-X_{Intra}}{End-Intra}$, where $[X = \frac{income}{output}, \frac{incomec}{consumption}, \frac{consumption}{output}]$. The averaging is carried out both without weights and by weighting with average gross state product or average population for respective period of time. Superscripts $1, 2, 3, 4$ stand for the respective stage of development: before intrastate deregulation, before interstate deregulation, after interstate deregulation and after intrastate deregulation. Subscript *red* stands for non-developed red states and *blue* for developed blue ones.

Chapter 5

Summary

In this thesis I have presented three self-contained essays on empirical issues in intranational economics and international fiance. My essays contribute to the existing literature on consumption risk sharing, US banking deregulation and international portfolio allocations. The main results of this thesis can be summarized as follows.

Chapter two provides new insights on the risk sharing pattern and its features across US states. We show that consumption risk sharing among US states is procyclical: it increases in booms and decreases in recessions. This result is mainly driven by the credit market channel of risk sharing because consumption smoothing is strongly procyclical and more than offsets the negative effect of business cycle on income smoothing. Further, we seek for the sources for the observed pattern of risk sharing. We find that business cycle fluctuations in risk sharing are more pronounced in states where small firms play more important role. However, our results suggest that banking deregulation in the US have had a strong impact on risk sharing and its dependence on the business cycle. First, banking deregulation has changed the pattern of risk sharing. What is more important, it has almost eliminated the effect of the business cycle on risk sharing being strongest in the states with many small firms. Therefore, our results corroborate empirical evidence of significant positive effects of banking deregulation on the real economy. This finding is especially important for the current discussion about upcoming reforms in banking sector after the financial crisis of 2007-2008.

Diversifying portfolio holdings can increase risk sharing and thus contributes to higher welfare through smoothed consumption. However, it is well-established fact that investors hold mainly domestic assets and do not make use of international diversification benefits. In **chapter three** I address this issue by exploring potential determinants of home bias. In so doing, I focus on real exchange rate hedging motive and calculate correlation coefficients between real exchange rate changes and excess returns for a comprehensive number of countries. These correlations are always positive and significant for the majority of countries. However, the only exception are EMU-countries that exhibit not significant correlation coefficients. In the next step, I show that estimated RER hedging term helps to explain existing home bias. In the longrun, a higher correlation of RER changes with excess returns implies higher holdings of domestic equity for emerging countries. Moreover, countries that are more open to trade, are more concerned about hedging RER fluctuatios.

Current global imbalances have forced researchers to seek for possible explanations for them. A growing literature suggests the financial integration of financially unequally developed countries to be the source of these imbalances. **Chapter four** examines implications of the interaction between financial development and financial integration for capital flows at intranational level. Unique experience of US states in intra- and interstate deregulations offers a natural experiment to study this question. At the moment of interstate banking deregulation, that can be regarded as financial integration of US states, not all states have implemented intrastate deregulation so that their degree of financial development differed a lot. Though theoretical models were constructed to explain *international* pattern of capital flows, my results confirm its predictions at intrastate level. That allows us to establish stylized facts of capital flow movements due to financial integration of heterogeneously developed countries.

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